SELF-REFERRED PATIENTS IN EMERGENCY DEPARTMENTS IN THE NETHERLANDS

NICOLE KRAAIJVANGER

Self-referred patients in Emergency Departments in the Netherlands

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Self-referred patients in Emergency Departments in the Netherlands
Thesis, Radboud University Medical Center Nijmegen, the Netherlands

ISBN: 978-94-92332-21-9
Cover design and lay-out: Esther Scheide, proefschriftomslag.nl
Printed by: Ridderprint

Financial support for this thesis was kindly provided by:
Nederlandse Vereniging van Spoedeisende Hulp Artsen
Vriendenfonds Rijnstate Ziekenhuis

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Proefschrift

Ter verkrijging van de graad van doctor aan de Radboud Universiteit Nijmegen
op gezag van de rector magnificus prof. dr. J.H.J.M. van Krieken,
volgens besluit van het college van decanen in het openbaar te verdedigen
op woensdag 27 juni 2018 om 16:30 uur precies

door Arnolda (Nicole) Martha Maria Kraaijvanger

geboren op 24 april 1986
te Sint-Oedenrode

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CHAPTER 1

General introduction and outline of the thesis

In the Netherlands, primary care is well established. During office-hours patients can visit their private general practitioner (GP), and during out-of-office hours patients can contact a GP-cooperative. The GP can treat the patient him/herself or decide that more specialized, acute medical care is deemed necessary and refer the patient to the Emergency Department (ED). GPs are therefore intended to act as gatekeepers to secondary care. However, patients can attend most EDs without a referral if their condition seems sufficiently urgent to them.

In the last two decades, GPs have reorganized out-of-hours primary care by forming large GP-cooperatives. Here, GPs are on call during out-of-office hours, using telephone triage performed by nurses and GPs, and consultations by GPs at the GP-cooperative and at patients' homes. [1] In order to make acute care more efficient, an increasing number of EDs and GP-cooperatives are collaborating by creating Emergency Care Access Points (ECAPs). At these ECAPs, patients register at a joint desk, where triage is used to decide whether a patient can be seen by a GP or needs to be seen at the ED.

In order to further promote the use of primary care and to reduce ED self-referral and healthcare costs, the Dutch government implemented a deductible excess fee. Currently, the minimum deductible excess fee is €385 per year. Until this deductible excess is reached, secondary care costs, including ED visits, are charged to the patient. After reaching the deductible excess, additional medical visits are fully covered by medical insurance. GP care is excluded from this deductible excess fee, which should provide a financial incentive for patients to visit a GP first before seeking secondary care.

Despite the improvements in the accessibility of primary care and the introduction of the deductible excess, 2 million patients visited Dutch EDs in 2015. This number has remained rather stable over the last years. The proportion of patients that visit the ED without a referral from their GP is close to 20%. [2] It has been stated that up to 80% of these self-referred patients do not need secondary care and therefore visit the ED inappropriately. [3] Inappropriate self-referrals contribute to crowding of EDs, which is currently becoming a major problem in Dutch EDs. In 2012, 68% of Dutch EDs reported that crowding occurred several times a week or even daily. [4] ED crowding can lead to an increasing length of stay in the ED and a delay in urgent care to patients. [5,6] In addition to the problem of crowding, EDs are designed to provide secondary emergency health care and are not ideal locations for primary or non-emergency healthcare: there is no continuity of care, there is a risk for unnecessary testing and an ED-visit is more costly than a primary care visit. [7,8] Inappropriate self-referral is therefore a significant burden for Dutch emergency care.

The aim of this thesis is to improve the understanding of the motives for self-referral and to study the effects of several interventions aimed at reducing (inappropriate) self-referral and length of stay in EDs. This thesis focuses mainly on ED self-referral within the Dutch healthcare system with easy access to primary care.

Specific aims of this thesis

- To identify reasons for self-referral to an ED.
- To identify the percentage of inappropriately self-referred ED-visits.
- To study the effects of introducing a copayment for self-referred ED-visits.
- To explore the association between care pathways and the length of stay in EDs.
- To develop an admission prediction tool that might contribute to the reduction of length of stay in an ED.

Outline of the thesis

In **chapter 2** a systematic review of the literature is performed, to explore the motives of self-referred patients to visit EDs worldwide. Healthcare systems are different between countries and the results of this review are interpreted in the context of these healthcare systems.

In **chapter 3** the motives for ED self-referral are explored using questionnaires in patients visiting the ED of a large Dutch teaching hospital. Subsequently, these reasons are compared between appropriate and inappropriate ED-visits. Predefined criteria are used to determine the appropriateness of ED-visits.

In **chapter 4**, the full range of considerations of self-referred patients for visiting the ED are explored in greater depth by performing a qualitative interview study, including patients with acute medical problems.

Some of the self-referred ED-visits are considered inappropriate, because patients receive care that a GP can also provide. In **chapter 5** the percentage of inappropriate ED-visits in a large nonselective group of self-referred patients is identified by 3 methods: 1) a set of predefined criteria is used; 2) the diagnoses and performed treatment in the ED are considered; and 3) the perspective of the patients is taken into account.

In 2008, the Dutch government implemented a deductible excess, also concerning ED-care. Despite the yearly increase of this excess fee, patients still visit the ED without referral from a GP. In **chapter 6** the possible effects of the introduction of a copayment, on top of the standard deductible excess, for self-referred ED-visits are studied. In

addition, the amount of copayment at which patients would visit a GP before visiting the ED is explored.

In **chapter 7**, the association between patients' length of stay in the ED and their care pathways (origin and destination) are compared, performing an observational, multicenter study. Seven Dutch EDs are included; three EDs with an ECAP are compared to four EDs without an ECAP.

An important contributing factor to overcrowding of EDs is the delay before hospital admission. Knowing the probability of hospital admission may help to anticipate admission and thereby reduce the length of stay in the ED. In **chapter 8** factors that influence the admission probability of ED patients are identified and a simple prediction tool, to calculate the probability of hospital admission directly after triage for a mixed population of ED-patients, is created. This prediction tool is multicenter validated and intended to reduce length of stay in the ED and contribute to a reduction of overcrowding.

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CHAPTER 2

Motives for self-referral to the Emergency Department: a systematic review of the literature

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BMC Health Serv Res. 2016 Dec 9;16(1):685

ABSTRACT

Background

In several western countries patients' use of Emergency Departments (EDs) is increasing. A substantial number of patients is self-referred, but does not need emergency care. In order to have more influence on unnecessary self-referral, it is essential to know why patients visit the ED without referral. The goal of this systematic review therefore is to explore what motivates self-referred patients in those countries to visit the ED.

Methods

Recommendations from the PRISMA were used to search and analyze the literature. The following databases; PUBMED, MEDLINE, EMBASE, CINAHL and Cochrane Library, were systematically searched from inception up to the first of February 2015. The reference lists of the included articles were screened for additional relevant articles. All studies that reported on the motives of self-referred patients to visit an ED were selected. The reasons for self-referral were categorized into seven main themes: health concerns, expected investigations; convenience of the ED; lesser accessibility of primary care; no confidence in general practitioner/primary care; advice from others and financial considerations. A random-effects meta-analysis was performed.

Results

Thirty publications were identified from the literature studied. The most reported themes for self-referral were 'health concerns' and 'expected investigations': 36% (95% Confidence Interval 23–50%) and 35% (95% CI 20-51%) respectively. Financial considerations most often played a role in the United States with a reported percentage of 33% versus 4% in other countries ($p< 0.001$).

Conclusions

Worldwide, the most important reasons to self-refer to an ED are health concerns and expected investigations. Financial considerations mainly play a role in the United States.

BACKGROUND

The utilization of Emergency Departments (EDs) is increasing in several high-income countries [1, 2]. Inappropriate presentations to EDs are a burden for healthcare systems, contributing to excess diagnostics and treatment, overcrowding of EDs and longer waiting times; all are associated with increasing health care costs [3–5]. This is important, because worldwide health care expenditures as a share of gross domestic product are increasing over the last years [6]. In addition, using the ED for primary care problems reduces continuity of care for patients.

Several countries experience high percentages of self-referred ED-patients. In England, 62.8% of ED- patients is self-referred [1]. In the United States (USA), relatively few general practitioners (GPs) are available and patients often self-refer to EDs or other types of specialized care [7]. In the Netherlands, despite its strong primary care network, 30% of ED-patients is self-referred [8]. Within the category of self-referred patients is a substantial number of patients that could have been taken care of in primary care. In a previous study, our group found that between 41.2 to 51.9% of self-referred patients in a Dutch ED visited the ED inappropriately [9]. This is crucial, because strategies that aim to reduce ED utilization should target inappropriate self-referral.

In order to reduce inappropriate self-referral, it is essential to know why patients visit the ED directly. The goal of this systematic review is to explore what motivates self-referred patients worldwide to visit the ED directly.

METHODS

Recommendations from the Preferred Reporting Items in Systematic Reviews and Meta-Analysis (PRISMA) were followed [10].

Search strategy and data sources

The following five databases: PUBMED, MEDLINE, EMBASE, CINAHL and Cochrane Library, were systematically searched from inception up to the first of February 2015. Searches were conducted using a combination of the following search terms: emergency department, self-referred, referral, walk-in, motives and reasons with appropriate wildcards and variations in spelling. The search in Pubmed was as follows: ("Emergency Service, Hospital" [Mesh] OR

"emergency department" OR "emergency room" OR "emergency unit" OR "emergency service" OR "emergency ward") AND (self-refer* OR refer* OR walk-in*) AND (motiv* OR reason*), no limits were used. A similar search was conducted for the other databases. The reference lists of the included articles were screened for additional relevant articles.

Inclusion criteria

Inclusion criteria were: study participants were self-referred patients in the ED (not referred by a GP and not brought in by ambulance), the study reported on reasons for patients to visit the ED without referral. All age groups and all disease categories were included. Different methods to study these motives were accepted. Only articles in English and Dutch language were included.

Data extraction

Two authors (NK and HL) independently and in duplicate reviewed the titles and abstracts of retrieved publications and subsequently the full text was reviewed for possibly relevant articles. From the included articles, data on study purpose, design, setting, sample size, patient characteristics, study quality and country where the study was conducted was extracted. Disagreements were resolved by discussion until consensus was reached. The PRISMA flow diagram is shown in Figure 1.

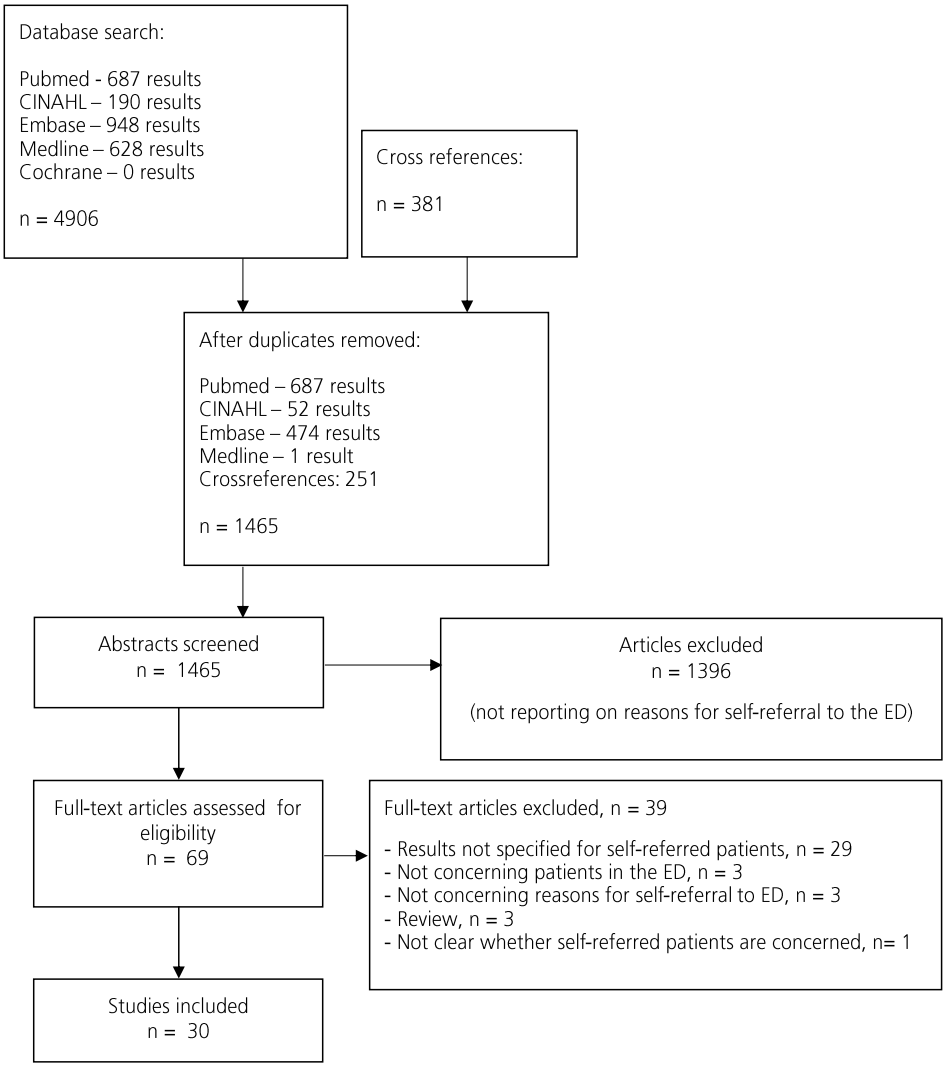
All different reasons for self-referral that were reported in the studies were listed. From these lists, seven themes for reasons for self-referral were identified by the study group (expert opinion) and consensus was reached within our group. Subsequently, the different reasons for self-referral that were found in the included articles were categorized into the seven themes. The themes were: health concerns; expecting investigations; convenience of the ED; lesser accessibility of primary care; no confidence in GP/primary care; advice from others; financial considerations (Appendix 1, 2).

Statistical analysis

A random-effects meta-analysis was used in which all eligible studies were included. The meta-analysis was performed using the inverse variance method, with an empirical Bayes estimator for the heterogeneity parameter tau2, a Hartung-Knapp adjustment, and anarcsine transformation of proportions. Results of the primary studies were reported with Clopper-Pearson exact confidence intervals. The software R, version 4.1-0, package meta, from Guido Schwarzer (2015) was used [11].

In order to investigate whether the differences in reasons for self-referral could be explained by different healthcare systems or different study methods, the following subgroup analyses were performed: reporting on a specific condition; continent; including multiple choice questions; possibility to select multiple answers with multiple choice questions; including a Likert Scale; the year in which studies were published in; inclusion of only patients with non-urgent medical problems; and included age group (children, adults, all ages).

Figure 1 – PRISMA flow diagram



RESULTS

Selected studies

Thirty studies were included, reporting motives for self-referral of 16450 patients [3, 5, 11–38]. The number of included patients differed considerably between the selected studies. Patient characteristics and study methodology were heterogeneous. Sixteen studies only included patients with non-urgent problems. [12, 14, 17, 19, 22, 24, 25, 27, 29–31, 34, 35, 37–39] Sixteen studies made use of questionnaires [3, 5, 12, 13, 16–19, 27, 31–33, 36–39], often with multiple choice questions [3, 5, 12, 13, 16, 19, 22, 27, 33, 37, 39] Three studies performed interviews with qualitative methodologies [29, 30, 34]. Others performed interviews without qualitative methods, sometimes by telephone, or by letting the treating physician or triage nurse ask one open question [14, 15, 20–26, 28, 31, 32, 35]. Most of the studies were performed in Europe and of the 19 European studies [3, 5, 11–27], 12 studies were performed in the United Kingdom (UK) [12, 14, 16, 18, 19, 21–26, 28]. The remaining studies were performed in the Netherlands [3, 5, 13, 17, 20], Ireland [15], Denmark [27], USA [29–34], Australia [37, 38], Hong Kong [35], Kuwait [36], and Israel [39] (Table 1).

Table 1- Selected studies, investigating motives for self-referral to the ED

	Article	Country, year of publication	Method	Number of patients	Inclusion/ exclusion
Europe					
1	Mestitz [28]	UK 1957	Questions asked by casualty medical officer	975 (770 SRPs)	Only adults?
2	Wilkinson et al [24]	UK 1977	Interviews, using questionnaires	546 (213 SRPs)	All ages Non-urgent
3	Myers et al [26]	UK 1982	Question asked	150	Only adults?
4	Singh [21]	UK 1988	Interviews, using semi-structured questionnaire	217	All ages
5	O'Halloran et al [16]	UK 1989	Postal questionnaires	145 (124 SRPs)	Age: 18 months to 16 years. Acute asthma
6	Stewart et al [18]	UK 1989	Questionnaires	853 (585 SRPs)	Children
7	Thomson et al [19]	UK 1995	Questionnaires	245 (147 SRPs)	Only adults? Non-urgent
8	Ward et al [25]	UK 1996	Question asked by treating physician	970 (339 patients answered question)	All ages Non-urgent
9	Laffoy et al [15]	Ireland 1997	Questionnaires, interviewer-administered	557 (395 SRPs)	All ages

	Article	Country, year of publication	Method	Number of patients	Inclusion/ exclusion
10	Shipman et al [23]	UK 1997	Telephone interviews, semi-structured	82	All ages
11	Rieffe et al [17]	Netherlands 1999	Questionnaires, Likert scale	430	Only adults? Non-urgent
12	Jaarsma-van Leeuwen et al [5]	Netherlands 2000	Questionnaires	1068	All ages Only surgical patients
13	Rajpar et al [22]	UK 2000	Interviews, using semi-structured questionnaire	54	All ages Non-urgent
14	Coleman et al [12]	UK 2001	Questionnaires	255	Adults Non-urgent
15	Norredam et al [27]	Denmark 2007	Questionnaire	3426 (2746 SRPs)	Age > 14 years Non-urgent
16	Moll van Charante et al [3]	Netherlands 2008	Postal questionnaires	808 (224 SRPs)	All ages
17	Mc Guigan et al [14]	UK 2010	Interviews by telephone, semi-structured	196	Age > 16 years Non-urgent
18	van der Linden et al [20]	Netherlands 2014	Open question by triage nurse	3028 (1751 patients answered question)	All ages
19	de Valk et al [13]	Netherlands 2014	Questionnaires	436	Age > 18 years
North America					
20	Hunt et al [33]	USA 1996	Questionnaires	1538	All ages
21	Koziol-McLain et al [34]	USA 2000	Interviews, qualitative methodology	30	Age > 18 years Non-urgent
22	Northington et al[31]	USA 2004	Questionnaire + brief interview	279	Age > 18 years Non-urgent
23	Howard et al [30]	USA 2005	Interviews, qualitative methodology	31	Age 18-50 years Non-urgent
24	Ragin et al [32]	USA 2005	Interviews + questionnaires with Likert scale	1536	Age > 18 years
25	Grant et al [29]	USA 2010	Interviews, qualitative methodology	112	Children Non-urgent
Asia					
26	Shah et al [36]	Kuwait 1996	Questionnaires, open ended question	1146	Only adults?
27	Lee et al [35]	Hong Kong 2000	Telephone interviews, using questionnaires	2410 (726 patients answered question)	All ages Non-urgent
Australia					
28	Masso et al [38]	Australia 2007	Questionnaire, Likert scale	397	All ages Non-urgent
29	Siminski et al [37]	Australia 2008	Questionnaires	400	All ages Non-urgent
Other					
30	Rassin et al [39]	Israel 2005	Questionnaire	73	Age > 18 years Non-urgent

SRPs = self-referred patients

Reasons for self-referral

Various motives for self-referral were found, with overlapping motives between studies. Percentages of the reasons reported by different studies were divergent. The reasons for self-referral were categorized into seven themes: health concerns; expecting investigations; convenience of the ED; lesser accessibility of primary care; no confidence in GP/primary care; advice from others; financial considerations. The different themes with examples are shown in Table 2.

Table 2 – Examples of the seven different themes

Theme	Examples cited in articles
Health concerns	- Perceived severity of problem - Seeking assurance - Patient perceived the complaint was urgent
Expecting Investigations	- Further research (eg X-rays) was necessary - Perceived facilities and investigations better at A&E - See doctor and have tests/x-rays done in same place
Advice of others	- On the advice of others - Sent by someone (usually employer) - They were referred by the staff (not the doctor) in PCP's offices to be evaluated in the ED
Convenience of ED	- Patient could get help earlier at the ED - The ED was nearby - Convenience of access
Accessibility of GP	- Patient could not reach the GP/GP-cooperative - Unavailability of GP - Too long wait for family doctor
Financial considerations	- Payment flexibility - Affordability - Low cost
No confidence in GP	- Patient had no faith/trust in the GP - Previous negative experience with the GP/GP-cooperative - Dissatisfied with GP

To find the most common reasons for self-referral, a meta-analysis was performed; the results are shown in Table 3.

Table 3 – Results of the meta-analysis, showing per theme the number of patients and studies and the percentage of patients indicating this theme as reason for their visit to the ED

Theme	Number of studies	Number of patients in these studies	% patients	95% CI (%)	I^2 (%)	95% PI (%)
Health concerns	22	5564	36	23 – 50	99.7	0 - 94
Expecting Investigations (radiological / blood tests)	10	1316	35	20 – 51	98.1	1 - 85
Advice of others	9	346	19	6 – 37	97.9	0 - 80
Convenience of ED	21	2939	18	11 – 26	99.5	0 - 62
Accessibility of GP	17	1744	13	9 – 18	92.4	0 - 36
Financial considerations	6	575	11	1 – 30	99.1	0 – 74
No confidence in GP	5	93	5	1 – 15	90.9	0 - 40

CI: Confidence Interval

I^2: the percentage of the total variation across studies due to heterogeneity; it takes values from 0-100% with the value of 0% indicating no observed heterogeneity

PI: Prediction interval: expected 95% range of outcomes, where the results of a new study would fall within

Health concerns were reported by 36% of the patients. This theme was reported by studies from all continents, and in studies including patients with urgent and non-urgent conditions [3, 12–18, 20–22, 24, 25, 27, 29, 31–33, 35–39].

Several factors that were related to the high variability in the reported percentages of health concerns were found. The two studies performed in Australia [37, 38] found the highest percentage of patients indicating health concerns as a reason for self-referral: 74% (95% CI 4-100%), versus 48% (95% CI 2–98%) in the USA [31–33], 25% (95% CI 13–41%) in Europe [3, 12–18, 20–22, 24, 25, 27] and 24% (95% CI 0–100%) in Asia [35, 36] (p=0.0003).

Health concerns were reported in 14% (95% CI 0–52%) in studies including only children [16, 18], versus 47% (95% CI 14–81%) in studies including only adults [12–14, 27, 31, 32, 36, 39] and 33% (95% CI 20–48%) in studies including patients of all ages [3, 15, 20–22, 24, 25, 33, 35, 37, 38] (p= 0.0014). Both the year in which a study was published and the use of a Likert scale had a small influence on the heterogeneity regarding health concerns; reflected by an I2 remaining higher than 97%.

Thirty-five percent of the self-referred patients visited the ED because they expected to need laboratory or radiological investigations. The studies reporting on this reason for

self-referral were all conducted in either Europe [3, 5, 12, 13, 15, 21–23, 26, 28] or Australia [37, 38].

Studies performed in Australia reported that 63% (95% CI 0–100%) of the included patients indicated this theme, compared to 28% (95% CI 16–44%) in studies from Europe (p= 0.01). Other subgroup analyses did not show significant associations.

The theme 'advice from others' was reported by 19% (PI 0-80%) of self-referred patients. In studies including only non-urgent patients [12, 14, 24, 25, 39] this theme was reported by 32% (95% CI 7–65%), versus 6% (95% CI 2–11%) in studies also including urgent patients [13, 16, 21, 26]. The year in which studies were performed also had an influence on the heterogeneity regarding the theme 'advice from others', which is probably explained by the fact that all studies published between 2000 and 2010 reporting on 'advice from others', included only non-urgent patients [12, 14, 39].

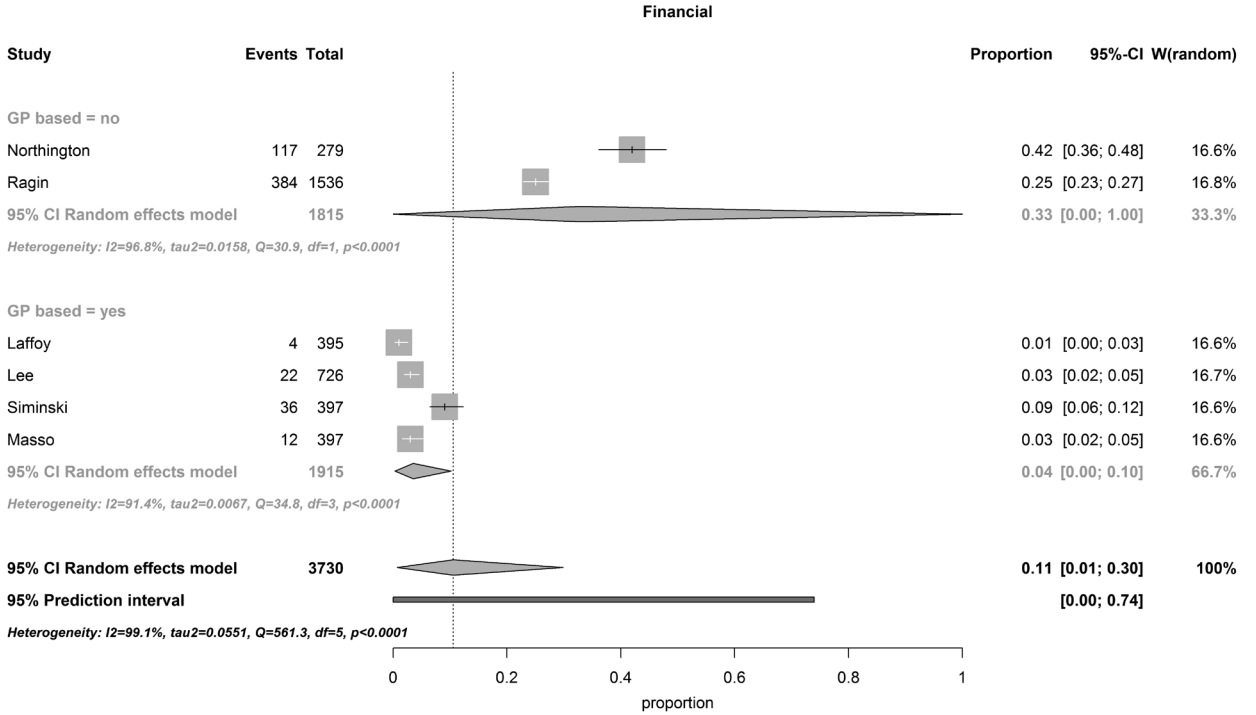
'Convenience of the ED' was reported by 18% (PI 0-62%) of self-referred patients. There were no subgroups with a significant relation to this theme.

The theme 'accessibility GP' was indicated by 13% (PI 0-36%) of self-referred patients. Multiple studies found patients claiming their GP is not available or not having a personal GP [3, 5, 12, 13, 17, 20–26, 29, 32, 35]. Several studies found patients declaring they did not think of their GP, were not aware of other services, such as a walk-in clinic or GP-cooperative, or did not know the location of an alternative service [5, 11, 12, 21, 22, 32]. Also within this theme, several studies found that patients turned to the ED, because they felt they had to wait too long for an appointment with their GP [5, 17, 23, 25, 28, 32] No statistically significant differences were found in subgroup analyses.

Financial considerations were reported by 11% (PI 0-74%) overall. Studies from the USA reported 33% of patients visited the ED because of financial considerations [29, 31, 32], followed by 6% in Australia [37, 38]; 3% in Asia [35] and 1% in Europe [15] (P=0.01). (Figure 2). Combining subgroups into non-GP-based countries (USA) versus GP-based-countries (remaining countries); we found 33% against 4% of patients citing financial considerations as reason for self-referral (P< 0.0001) (Fig. 2). Studies including only adults [31, 32] found 33% (95% CI 0–100%) reporting on financial considerations, versus studies including patients of all ages [15, 35, 37, 38], with 4% (95% CI 0–10%), (P< 0.0001).

Figure 2 – Self-referred patients visiting the ED out of financial motives in GP-based countries versus non-GP –based countries (USA)

The two studies originating from the United States, reporting on financial considerations as a reason for self-referring to the ED, found significantly higher percentages of self-referred patients visiting the ED for this reason than studies from other continents did.



Lack of confidence in their GP was reported by 5% (PI 0-40%). Only studies from the UK [16, 24, 25] and the Netherlands [6, 13] reported on this reason for self-referral.

For none of the themes, the variation in the percentages could be explained by the use of multiple choice questions (with or without multiple possible answers) or the inclusion of only patients with a specific condition.

DISCUSSION

EDs are designed to provide emergency care and are not ideal locations for primary care, because there is no continuity of care, there is a risk for unnecessary testing and an ED-visit is more costly than a primary care visit [40]. This review shows that health concerns and the expectation to need further investigations are the most frequently reported motives to visit an ED without referral. Both motives reflect patients worried about their health, seeking urgent medical care. This is remarkable, because sixteen out of thirty of the selected studies only included patients with non-urgent problems. Patients may often be unable to judge the severity of their condition and may view non-urgent symptoms as urgent.

These two most common motives are difficult to address; there will always be differences between self-assessed and clinically assessed urgency and patients can only be expected to act on their own perceptions. Awareness programs that have been studied showed a limited effect. In one study, performed in the USA, people received a booklet with general information on when to visit an ED, but this did not show a significant effect on the number of ED-visits [41]. Education directed at specific conditions (ear pain in children, diabetes, asthma) and more intensive programs for geriatric or older, chronically ill patients have shown mixed results [42–47]. The effect of telephone consultation for patients to call for advice about their current health symptoms prior to seeking treatment at the ED also seems insufficient. In 1998, the UK introduced NHS Direct; a national nurse-led telephone advice service. Data suggested that this service reduced the number of calls to GP-cooperatives, but did not have a significant impact on the number of ED-visits [48]. Since 2014, NHS Direct has been replaced by NHS 111 with better integration with other health services. However, also NHS 111 has failed to reduce the number of ED-visits [49]. In the Netherlands, the implementation of ECAPs, a system where patients who unnecessarily visit the ED can be triaged to GPs, showed promising results in decreasing ED-utilization [50].

Health care systems are different between countries. The largest differences consist of how primary care is organized and the charges patients face when consulting a GP or ED. The results of this review should therefore be interpreted in the context of these health care systems.

Europe

Health care system

Most European studies were performed in the UK and the Netherlands. These countries have similar health care systems, which heavily rely on primary care and most patients have a personal GP. During out-of-office hours patients can visit GP-cooperatives or walk-in clinics to get primary care. GPs are supposed to act as gatekeepers to secondary or specialist care, but patients can attend the ED without a referral if their condition, in their opinion, seems sufficiently urgent to them. In the Netherlands, people have a deductible excess charge of €385 a year (in 2016); the first €385 of medical bills, including the costs of an ED-visit, is charged to the patient. In contrast, emergency care is free of charge in the UK. GP-care is free of charge in both countries [51–53].

Despite the well-developed primary care systems, both countries have substantial numbers of self-referred ED-visits. Hospital Episode Statistics reported that in 2012–13, 64.1% of ED-visits (also including visits to minor injury units and walk-in centres) in England were self-referred [54]. In the Netherlands, 30% of ED-patients were self-referred in 2012 [8]. It has been shown that many of these patients visit the ED inappropriately [9, 52]. At the same time, ED crowding and ED waiting times are increasing, which underlines the importance of reducing the number of inappropriate self-referred patients [8, 55, 56].

Study findings

European studies found that patients reported visiting the ED because they expected that they needed laboratory or radiological investigations. Patients cannot get the same level of care with their GP and they visit an ED, when they expect that more advanced care will be necessary. A well-established primary care system does not change this.

Only studies from the UK and the Netherlands, reported a lack of confidence in their GP as a reason for self-referral to an ED, albeit with a low percentage. However, this is probably merely a reflection of the strong primary care network.

Practice implications

In the Netherlands, recent years an increasing number of EDs and GP-cooperatives are collaborating by creating Emergency Care Access Points (ECAPs) to reduce the number of self-referred ED-visits. During out-of-office hours, patients register at a conjoint desk, from where they are triaged to be seen by a GP or at the ED. This system shows promising results and is associated with an overall decrease in the number of ED-visits, almost disappearance of self-referred patients and a higher probability of hospital admission [50].

USA

Health care system

The health care system of the USA developed largely through the private sector, and combines high levels of funding with a low level of government involvement [57]. It has a small proportion of GPs and relies heavily on internal medicine and pediatrics for primary care [7]. In addition, the USA used to have a large proportion of uninsured or underinsured patients and patients often faced high costsharing, including deductibles for primary care [57]. Because EDs are the only place where the poor could not be turned away, EDs were disproportionally used by low-income and uninsured patients who could not afford care in other settings [58]. In an attempt to deter inappropriate visits from EDs, several states implemented co-payments for non-emergency visits.

Recently, the health care system in the USA has undergone several changes, with the implementation of the Patient Protection and Affordable Care Act (PPACA) since 2010. With PPACA the percentage of uninsured patients is declining [59]. In addition, the funding for health centers was increased, which deliver preventive and primary health care to patients, regardless of their ability to pay. Between 2007–2015 these health centers have increased the number of patients served from 16 million, to 24 million annually [60].

Despite these measures, it seems that the number of ED-visits is still increasing: from 95 million in 1997, to 130 million in 2010 [61, 62]. In 2015, the American College of Emergency Physicians (ACEP) found that the majority of emergency physicians have noticed an increase in the volume of emergency patients since the requirement to have health coverage took effect in the PPACA in 2014 [63]. In addition, the number of EDs has decreased over the last years. Together, this leads to more overcrowded EDs [64].

Study findings

Studies from the USA reported significantly more frequently on issues with health-insurance and costs. This is to be expected, considering the charges patients faced when seeking medical care. However, all included studies were performed before the implementation of the PPACA, so it is not clear whether this affects the motivation of patients to visit the ED.

Practice implications

New research is necessary to see whether the motives for self-referral have changed since the PPACA was introduced.

Australia

Health care system

Australia has a complex health care system, with public and private funders and providers; including public and private hospitals with EDs. Medicare, the tax-funded national health insurance scheme, offers patients free, self-referred access to the ED. GPs act as gatekeepers to the rest of the health care system, since patients need a GP-referral to consult a specialist [65].

It is estimated that the number of public ED-visits increased by 3.4% on average each year between 2010 and 2015. In 2014–15 there were about 7.4 million ED-consultations in public hospitals; 75% of patients who visited the ED had an arrival mode of 'Other'; meaning they walked in or came by private or public transport, community transport or taxi. Ten percent were triaged as non-urgent [66].

Study findings

Studies from Australia found the highest percentage of patients visiting the ED out of health concerns and with the expectation to need investigations. There is no clear explanation for this finding.

Practice implications

Both motives are difficult to address.

Overall

Studies have shown that a strong primary care network may help to reduce the number of self-referred patients in the ED, especially when patients have access to a GP for immediate care [67]. In our study, 13% of self-referred patients visited the ED because of the limited accessibility of primary care. So, better organization of primary care, with fast and easy access, might reduce the relatively small, but substantial number of patients self-referring to for this reason. Remarkably, we found no difference between continents in the percentage of the theme 'accessibility of the GP' was reported, despite the varying accessibility of primary care in the different healthcare systems. This might be because this theme reflects patients not getting a timely appointment with their GP in one country versus not having a personal GP in another country. Despite the well-established primary care in Europe and Australia, the number of non-urgent patients in EDs is substantial. This may be caused by the fact that the countries that have well established primary care systems also have well established healthcare insurance systems and historically have low thresholds for seeking medical consultation. The results of this

study show that health concerns are a major motivation for patients to self-refer to the ED, including for patients with non-urgent symptoms. This might be an important explanation for the limited effects of previous interventions; people, who are worried about their health, will not be easily discouraged in seeking help at the ED. A solution in which a medical professional can triage self-referred patients to either a GP or the ED could relieve the patient of the burden of choosing the appropriate facility to present to, without discouraging patients to seek urgent medical care if needed. We believe the introduction of ECAPs may be that solution; the data on the effectiveness of ECAPs is promising, but is limited and subject to future research of our group.

Strengths and limitations

Strength of this study is that it reviews motives from self-referred patients worldwide, which provides data on what motives patients have to seek urgent medical care in EDs. These data can be used by policymakers to adjust healthcare systems in order to decrease self-referral associated costs. In addition, this study interprets the results of this review by taking into account the differences of healthcare systems in which the studies were performed.

This study only includes studies in Dutch and English and might therefore have missed some relevant articles.

Seven articles used multiple choice questions, with the option of selecting multiple answers [12, 13, 15, 16, 33, 37, 39]. Unfortunately, it is not clear from these articles how many patients selected multiple answers. This makes it impossible to assess what reasons were most important for these patients in self-referring to the ED.

This review could not explore whether motives for appropriate and inappropriate visits differ, because the included studies did not report on the appropriateness of ED-visits.

Large variations in reported percentages of reasons for self-referral between studies were found, reflected by wide prediction intervals and high levels of heterogeneity. Subgroup analyses were performed in order to analyze whether this could be explained by different healthcare systems or study methods, but not all heterogeneity could be explained. It is plausible that other, unknown factors that are not reported in the original manuscripts influence the reported percentages and the inability to explain reporting heterogeneity might therefore be.

CONCLUSION

Reasons for self-referral to EDs differ slightly with different healthcare systems. Worldwide, the most important reasons to self-refer to an ED are health concerns and additional investigations. Financial considerations mainly play a role in the United States.

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CHAPTER 3

Self-referrals in the Emergency Department: reasons why patients attend the Emergency Department without consulting a general practitioner first - a questionnaire study

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Int J Emerg Med. 2015 Dec;8(1):46

ABSTRACT

Background

To influence self-referral, it is crucial to know a patient's motives to directly visit the Emergency Department (ED). The goal of this study is to examine motives for self-referral to the ED and compare these motives in relation to appropriateness.

Methods

All self-referred patients visiting the ED of a Dutch hospital over four separate months in a 1-year period were included. Patients were handed questionnaires that included questions on their reasons to visit the ED directly and where they would seek medical help next time. Additionally, the motives of patients that either appropriately or inappropriately visited the ED were compared. In a previous study on the same patient cohort, the appropriateness of the ED visits was determined using predefined criteria.

Results

A total of 3196 self-referred patients were included, and 48.9 % completed the questionnaires. The majority of patients (28.0 %) attended the ED without a referral because they thought they would get help faster; the next reason was the easier access to radiologic and laboratory investigations (answered by 23.8 %); and the third was the symptoms were considered too severe to visit a general practitioner (GP) (answered by 22.7 %). The majority (78.5 %) would attend the ED the next time they are faced with similar symptoms. Appropriate visits were significantly more seen in females, elderly, and patients in higher triage categories. Patients who expect investigations are necessary, think their symptoms are too severe to visit a GP, or would return to the ED next time were more often appropriately visiting the ED.

Conclusions

The choice of patients to self-refer to an ED is often an explicate decision. Patients are looking for specialist help and want fast and easy access to radiologic and laboratory investigations. Even though the primary care network is well developed in the Netherlands, the reasons for self-referral are similar to the reasons found in previous literature based in other countries. Patients who visit the ED because of health concerns visit the ED more often appropriately than patients visiting for practical reasons.

BACKGROUND

The question of inappropriate self-referrals to the Emergency Department (ED) is contentious and continues to provoke discussion in the light of increasing healthcare expenses and crowding.

The healthcare system in the Netherlands has a strong primary care network. The general practitioner (GP) serves as a gatekeeper, referring patients with acute illnesses to the ED, only if deemed necessary. During working hours, patients can consult their own GP; in out-of-office hours, they can consult a GP at a GP cooperative. However, patients can also choose to go directly to the ED. A recent Dutch study found that self-referred visits account for an average of 30 % of all ED visits [1]. Many of these patients present with problems that possibly could be taken care of by a GP at lower costs [2–4]. Consequently, to reduce costs, policymakers in healthcare and insurance companies are investigating methods to reduce the number of self-referrals to the ED.

In the Netherlands, people are obligated to have health insurance. In 2008, a deductible of €150 was introduced. This deductible gradually increased over the years to €375 in 2015. When someone reaches their deductible amount, additional medical visits (including ED visits) are fully covered by medical insurance. This deductible does not apply to care provided by a GP. Despite these measures, the number of ED visits has not decreased over the past years and it is not clear whether the number of inappropriate visits has.

To influence self-referral, it is essential to know the patient's motives to directly visit the ED, bypassing their GP. Previous studies found multiple reasons for patients to self-refer to the ED, ranging from practical issues to concerns of having a serious condition [3, 5–13]. However, most of these previous studies did not include the entire ED population or were not conducted in the Netherlands. The goal of this study is to explore the motives of self-referred patients to directly visit the ED in the Netherlands and to compare the motives of patients either appropriately or inappropriately visiting the ED.

METHODS

Study design

This is an observational and prospective study. Self-referred patients in the ED were handed questionnaires with questions on their reasons to visit the ED. Next, predefined

criteria (Table 1) were used to compare the motives of patients that either appropriately or inappropriately visited the ED.

Study setting

This study is performed in the ED of a 955-bed community teaching hospital in the Netherlands (Rijnstate Hospital) that covers an area with 460,000 inhabitants. The ED is 24/7 staffed by a team consisting of nine emergency physicians and 27 emergency medicine residents. In 2012, there were 36,721 ED visits, of which 12,383 patients (33.7 %) were hospitalized. The nearest GP cooperative is 5.6 km (3.48 miles) away.
In 2012, 93 EDs were operational 24/7 in the Netherlands. Twenty-eight EDs were in hospitals of the association of tertiary medical teaching hospitals (STZ-hospitals), as is the Rijnstate Hospital. In this category, there was an average of 31,346 visits per ED in 2012 (ranging from 17,000 to 50,000 ED visits). The average percentage of hospitalized patients in STZ-hospitals was 32 % (ranging from 8 to 43 %) [1].

Participants

After approval from the Local Ethics Committee of the Rijnstate Hospital, all self-referred patients visiting the ED were included. Patients attending the ED on their own initiative, without a referral from a GP and not brought in by ambulance were considered 'self-referred'. No exclusion criteria were used. To avoid bias based on seasonal variation, patients were included in four separate months (April, July and October of 2012, and January of 2013). This patient cohort was subject of a previous study, concerning the percentage of appropriate visits of self-referred patients in the ED [4].

Questionnaires

Questionnaires were handed to the participants. When the patient was under the age of 12, caregivers were asked to fill out the questionnaire. First, they could fill in what the reason (symptom) was to attend the ED. These reasons were then coded using the 'Reason for Visit Classification for Ambulatory Care', developed by the US Department of Health, Education, and Welfare in 1979 [14]. Second, patients could fill in why they visited the ED directly. This was a multiple choice question, but there was a possibility to give an open answer. When patients wrote a statement that was similar to one of the multiple choice answers, it was classified as such. When patients chose more than one answer to this question, all answers were included. Third, patients could fill in where they

would go the next time, confronted with similar symptoms; this was a multiple choice question. Informed consent was obtained from the participants.

Appropriate versus inappropriate visits

The motive of self-referrals to directly visit the ED was the primary outcome of this study. In addition, the motives of patients that either appropriately or inappropriately visited the ED were compared. In a previous study, performed on the same patient cohort, the percentage of appropriate visits to the ED was determined using predefined criteria [4]. These criteria classified an ED visit as appropriate, when it warranted diagnostic testing or treatment that could only be performed in a hospital (Table 1). These criteria were applied after the primary assessment in the ED and were not known to the treating physician. The predefined criteria classified 1878 ED visits (58.8 %) as appropriate.

Statistics

All data were analyzed in SPSS Statistics (SPSS Inc. PASW Statistics for Windows, version 19.0). Descriptive statistics were used to describe the patient population. We explored whether the appropriateness of an ED visit was related to gender, age, Manchester triage category, reasons to visit the ED directly and where patients would seek medical help next time. Differences in distributions of these categorical variables were compared using the Pearson chi-square test. A P value less than 0.05 was considered statistically significant. To control the false discovery rate in multiple testing (i.e. reduce the probability of type I errors), the Benjamini-Hochberg method was used.

Table 1 – Predefined criteria determining the appropriateness of the ED-visit.

Secondary care (appropriate)	Primary care (inappropriate)
Laboratory investigations	Urine testing only
ECG	
Immediate radiological investigations (X-ray, CT, ultrasound, MRI)	
Extensive wounds that needed follow-up in a specialist office	Simple suture wounds, that did not need follow-up or could be followed-up by a GP
Complications / symptoms related to previous hospital treatment	
Indication for surgery	
Hospital admission	

RESULTS

During the inclusion period, a total of 12,409 patients attended the ED. Twenty-six percent (3196 patients) visited the ED without a referral from a GP (of which 9.4 % were hospitalized). A total of 1563 patients completed the questionnaire, which results in a response rate of 48.9 %. Of these patients, 6.2 % was hospitalized. Table 2 shows the patient characteristics and the percentages of different patient categories either appropriately or inappropriately visiting the ED. Appropriate visits were significantly more seen in female patients, elderly and higher triage categories.

Table 2 – Patient characteristics versus appropriateness

Category	Variable	Total N (%)	Quest. N (%)	Appropr.N(%)	Inapp.N(%)	P-value
Gender	Male	1875 (59)	932 (50)	519 (56)	413 (44)	0.019
	Female	1321 (41)	631 (48)	389 (62)	242 (38)	
Age	< 18	697 (22)	337 (48)	177 (53)	160 (48)	<0.001
	18-39	1308 (41)	646 (49)	347 (54)	299 (46)	
	40-59	778 (24)	386 (50)	253 (66)	133 (35)	
	60-79	346 (11)	162 (47)	106 (65)	56 (35)	
	>80	67 (2)	32 (48)	25 (78)	7 (22)	
Manchester Triage category	Red	1 (0.03)	0 (0)	0 (0)	0 (0)	<0.001
	Orange	178 (6)	57 (32)	51 (89)	6 (11)	
	Yellow	1189 (37)	550 (46)	378 (69)	172 (31)	
	Green	1788 (56)	944 (53)	477 (51)	467 (49)	
	Blue	30 (1)	12 (40)	2 (17)	10 (83)	
	No triage	10 (0.3)	0 (0)	0 (0)	0 (0)	

Total N(%) = Number of self-referred patients per group (percentage of category)

Quest.N(%) = Number of questionnaires filled out per group (percentage)

Appropr N(%)= Number of appropriate visits by patients that filled out the questionnaires per group (percentage of appropriate visits per group)

Inapp. N(%)=Number of inappropriate visits by patients that filled out the questionnaires per group (percentage of inappropriate visits per group)

P-value: Appropriate versus inappropriate, per category

Fifteen hundred thirty-seven patients (48.1 %) filled out their reason (symptom) to visit the ED. Using the Reason for Visit Classification, 201 different reasons were registered. The most common reasons for visiting the ED were injuries and musculoskeletal symptoms, followed by malaise symptoms and abdominal complaints (Table 3).

Table 3 – Ten most common reasons for visit, classified into categories using The Reason for Visit Classification.

Code	Reason for Visit Category	Number	Percentage
J505-J575	Injury, type unspecified *for example: 'foot bumped', 'hurt my hand'*	356	23.2
J205-J230	Injury, lacerations and cuts *for example: 'cut in finger'*	253	16.5
S900-S999	Symptoms referable to the musculoskeletal system, excluding injuries *for example: 'low back pain', 'stiffness knee'*	195	12.7
J800-J899	Injury, not otherwise specified *for example: 'motor vehicle accident', 'fell from stair cases'*	132	8.6
S001-S099	General symptoms *for example: 'malaise', 'fainting'*	113	7.4
S500-S639	Symptoms referable to the digestive system *for example: 'abdominal pain', 'nausea'*	98	6.4
J001-J050	Injury, fractures and dislocations *for example: 'fracture wrist', 'dislocated shoulder'*	89	5.8
J105-J130	Injury, sprains and strains *for example: 'sprained ankle', 'twisted knee'*	49	3.2
S400-S499	Symptoms referable to the respiratory system *for example: 'shortness of breath', 'pain throat'*	40	2.6
S300-S399	Symptoms referable to the eyes and ears *for example: 'red eye', 'pain ear'*	33	2.1

Fifteen hundred sixty one patients (48.8 %) answered the question why they attended the ED without a referral. Table 4 shows the distribution of the given answers. The three most chosen reasons were the following: the expectation to get help faster going directly to the ED (437 patients, 28.0 %), the expectation to need radiologic or laboratory investigations (372 patients, 23.8 %), and the presumption that the symptoms were too severe to visit a GP (355 patients, 22.7 %). When focusing on appropriateness in relation to these answers, it is notable that patients expecting investigations to be necessary or thinking their symptoms are too severe to visit a GP significantly more often appropriately visited the ED. Patients that were from a different region were significantly less often classified as appropriately visiting the ED.

Patients could also choose to give an open answer to this question; this was done by 191 patients. Different answers, that were not a multiple choice option, were given: 'The concierge send me to the hospital', 'I want more specific help, like stitches, injections etc., 'My GP will send me to the ED anyway', and 'I did not want to take any risk'.

Table 4 – Answers to the question why self-referred patients directly attended the ED.

Multiple choice answer	Number (%)	Appropriate (%)	Inappropriate (%)	P-value
Patients that answered this question	**1561**	**908 (58.2)**	**653 (41.8)**	
Takes less time	437 (28.0)	250 (27.5)	187 (28.6)	0.632
Investigations necessary	372 (23.8)	246 (27.1)	126 (19.3)	**<0.001**
Symptoms too severe	355 (22.7)	227 (25.0)	128 (19.6)	**0.012**
Not from the region	258 (16.5)	131 (14.4)	127 (19.4)	**0.008**
GP not available	145 (9.3)	83 (9.1)	62 (9.5)	0.812
GP could/would not see me	130 (8.3)	65 (7.2)	65 (10.0)	0.049*
No confidence in GP	47 (3.0)	30 (3.3)	17 (2.6)	0.424
No GP	20 (1.3)	8 (0.9)	12 (1.8)	0.097

Patients could choose more than one answer.

Number (%): Number of patients that chose this answer (percentage)

Appropriate (%): Number of patients that chose this answer, whose visit was considered appropriate (percentage of patients with an appropriate visit that chose this answer)

Inappropriate (%): Number of patients that chose this answer, whose visit was considered inappropriate (percentage of patients with an inappropriate visit that chose this answer)

*After applying the Benjamini-Hochberg method this P-value is no longer significant

Fourteen hundred six patients (44.0 %) answered the question where they would go the next time they are suffering from similar symptoms. The majority, 1104 patients (78.5 %), answered they would again turn primarily to the ED, 320 patients (22.8 %) would visit a GP or a GP cooperative next time, and 16 patients (1.1 %) would seek no medical help at all. Some patients selected multiple answers to this question. When appropriateness was taken into account in relation to these answers, it was found that patients returning to the ED were significantly more often appropriately visiting the ED, whereas patients that would turn to their GP or seek no medical help were significantly more often inappropriately visiting the ED (Table 5).

Table 5 – Answers to the question where self-referred patients would seek medical help, confronted with similar symptoms.

Multiple choice answer	Number (%)	Appropriate (%)	Inappropriate (%)	P-value
ED	1104 (78.5)	686 (62.1)	418 (37.9)	<0.001
GP	320 (22.8)	144 (45.0)	176 (55.0)	<0.001
No medical help	16 (1.1)	5 (31.3)	11 (68.8)	0.029

The Benjamini-Hochberg method was applied on the tests shown in Tables 2, 4, and 5. After this correction, the P value 0.049 is no longer significant (Table 4: GP could/would not see me).

DISCUSSION

The present study used questionnaires to explore motives of self-referred patients visiting the ED. It is remarkable to see that the reasons for self-referral are similar even in the Netherlands, which has a well-developed primary care system.

This study found that the main reason for most patients to skip a visit to their GP and go straight to the ED is the expectation that they would get medical help sooner. Several patients answered that it is devious to visit a GP or GP cooperative first, to be referred to an ED 'anyway'. This is mostly true in a situation where the GP cooperative and ED are not closely situated, like it is the case in the hospital this study was conducted in. Previous research also found that time is playing a major role in choosing to attend an ED [3, 9, 15]. Many self-referrals responded that their symptoms were too severe to visit a GP. This is consistent with earlier studies showing that health concerns and the belief of having an urgent medical problem play a major role in deciding to attend an ED [7–13, 16]. Furthermore, this study, in concordance with previous research, found that patients often are convinced that they need radiologic or laboratory investigations to get a diagnosis [3, 6, 16]. It therefore seems a logical step to attend to the ED directly, where it is possible to get these investigations. Consistent with previous literature, this study found that patients are frequently supported in their decision to visit an ED by family members or paramedics [6, 11]. The majority of the self-referred patients visited with injuries and other symptoms of the musculoskeletal system. Our results are again consistent with previous studies, showing that injuries and musculoskeletal symptoms are frequent reasons to attend an ED [3, 6, 11, 17].

Multiple non-Dutch studies found that the unavailability of a GP is a major reason to self-refer to an ED, especially after hours [7, 8, 15, 16]. The present study found that this was a reason to attend the ED for almost a fifth of the self-referrals. This result, however, is in contrast with previous Dutch studies on this subject, stating that problems in consulting a GP were not often a reason to self-refer [3, 18]. This discrepancy is interesting. In the Netherlands, the primary healthcare system is well organized: patients can visit their own

GP in daytime and, with the continuing development of GP cooperatives since the mid-1990s, they have a perceived easy access to primary care in the evening and night as well. The present study shows that Dutch patients nonetheless are having difficulties in gaining an appointment with a GP in a timely manner. This might be caused by increasingly busy general practices and enlarging GP cooperatives taking care of growing numbers of patients, leading to more bureaucracy and stricter regulations for getting an appointment. In addition, the modern patient seems to expect and demand medical care at the moment he/she thinks this is mandatory, and is increasingly less willing to wait for an appointment. When concentrating on the appropriateness in relation to the answers patients selected, it seems that patients do have a sense of when to visit the ED for their symptoms. Patients visiting the ED because of health concerns are more often visiting the ED appropriately than patients visiting out of practical reasons. To the best of our knowledge, there are no previous studies looking at the motives of self-referred patients for visiting the ED in relation to the appropriateness of their visits.

Limitations

This study made use of a questionnaire that was not validated. However, to the best of our knowledge, there is no validated questionnaire regarding this subject. The response rate to the questionnaire was 48.9 %, which is relatively low. This makes it possible that the included answers are not a reflection of the opinion of all self-referred patients. This study made use of predefined criteria to determine whether an ED visit was appropriate. This method can lead to an overestimation of the number of appropriate visits because it is possible that physicians working in the ED order more investigations than a GP would with the same patient. In our previous study, we also used diagnoses and treatments given to the included patients to determine appropriateness [4]. With this method, 48.1 % of the self-referrals was found appropriate versus 58.8 % using the predefined criteria. In order to make the current study not too complicated, the choice was made to include only the predefined criteria.

Another limitation of this study is the possibility of interobserver bias. Different physicians working in the ED may order different investigations with similar symptoms, which can lead to different outcomes using the predefined criteria. These individual variations are not completely avoidable, and the effect on the percentage of appropriateness is not clear. This study was performed in a single ED. This limits the possibility to extrapolate the results to other EDs in the Netherlands or other countries.

CONCLUSIONS

This study, carried out in a community hospital in the Netherlands, found that the choice of patients to self-refer to an ED is often a considered decision. Patients are looking for specialist help for their perceived urgent symptoms and want fast and easy access to radiologic and laboratory investigations. While the Netherlands has a well-developed primary care network, the reasons for self-referral in the Netherlands are similar to reasons found in previous literature based in other countries. Despite the strong primary care, Dutch patients report difficulties in gaining a timely appointment with a GP. Patients visiting the ED out of health concerns are more often visiting appropriately versus patients visiting for more practical reasons.

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CHAPTER 4

Why patients self-refer to the Emergency Department: a qualitative interview study

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J Eval Clin Pract. 2017 Jun;23(3):593-598

ABSTRACT

Rationale, aims, and objectives

There have been multiple studies investigating reasons for patients to self-refer to the Emergency Department (ED). The majority made use of questionnaires and excluded patients with urgent conditions. The goal of this qualitative study is to explore what motives patients have to self-refer to an ED, also including patients in urgent triage categories.

Methods

In a large teaching hospital in the Netherlands, a qualitative interview study focusing on reasons for self-referring to the ED was performed. Self-referred patients were included until no new reasons for attending the ED were found. Exclusion criteria were as follows: not mentally able to be interviewed or not speaking Dutch. Patients who were in need of urgent care were treated first, before being asked to participate. Interviews followed a predefined topic guide. Practicing cyclic analysis, the interview topic guide was modified during the inclusion period. Interviews were recorded on an audio recorder, transcribed verbatim, and anonymized. Two investigators independently coded the information and combined the codes into meaningful clusters. Subsequently, these were categorized into themes to build a framework of reasons for self-referral to the ED. Characteristic quotes were used to illustrate the acquired theoretical framework.

Results

Thirty self-referred patients were interviewed. Most of the participants were male (63%), with a mean age of 46 years. Two main themes emerged from the interviews that are pertinent to the patients' decisions to attend the ED: (1) health concerns and (2) practical issues.

Conclusions

This study found that there are 2 clearly distinctive reasons for self-referral to the ED: health concerns or practical motives. Self-referral because of practical motives is probably most suitable for strategies that aim to reduce inappropriate ED visits.

INTRODUCTION

Primary care in the Netherlands is well developed, with a general practitioner (GP) available during the day and a GP-cooperative available during out-of-office hours. The GP can refer patients to the Emergency Department (ED) if urgent specialized care is deemed necessary. However, patients also may decide to visit an ED without consulting a GP, termed "self-referral." In the Netherlands, an average of 30% of all patients seen in EDs is self-referred. This number ranges from 3% to 76% for individual EDs. [1] In 41% to 52%, health issues of self-referred patients can be taken care of in a primary care facility at lower costs. [2,3] When treating minor illnesses at a hospital ED, there is a risk of overuse of diagnostic modalities and overtreatment.

There have been several studies on the motivations of patients to self-refer to the ED. Reasons that came up are the belief that the condition needs immediate attention and that laboratory or radiologic investigations are necessary. Some patients expect that they will get medical treatment faster at the ED or perceive the ED to be easier accessible. Also, people encounter difficulties in gaining an appointment with a GP or have been advised by others to directly attend to an ED. [4–14] Self-referred patients in urgent triage categories visit the ED appropriately more often. [2] However, patients may view nonurgent symptoms as urgent, leading to inappropriate self-referral and unnecessary costs.

Previous studies on motives of self-referral generally used questionnaires and seldom included patients with acute medical problems. Although questionnaires can be very useful to quantify responses, they do not provide in-depth insight in patient motives. To explore the full range of considerations of self-referred patients in greater depth, including those of patients with acute medical problems, this qualitative interview study was performed.

METHODS

Goal

The goal of this qualitative study is to explore what motives patients have to self-refer to an ED. Performing a qualitative methodology, we are not in search for results that can be generalized to the entire population; rather, we are exploring the entire pallet of

views and perceptions that exist within self-referred ED patients concerning self-referral. To obtain an optimal representation of the wide range of views of self-referred patients, we also included patients in urgent triage categories (ie, red, orange, and yellow triage categories, using the Manchester Triage System).

Setting

This qualitative interview study was performed at the ED of a large teaching hospital in the east of the Netherlands from November 2014 until February 2015. This ED covers an area of 460 000 habitants and had 37 316 visits in 2014, where self-referrals accounted for 19.6% of these visits. The nearest GP-cooperative is 5.6 km (3.48 miles) away. The local ethics committee approved the study.

In the Netherlands, patients have a GP available during the day and a GP-cooperative available during out-of-office hours. Patients can also visit an ED without consulting a GP. Almost all patients have health insurance, but may have to pay an additional fee when visiting the ED, depending on their insurance. The costs for an ED visit can thus be hundreds of Euros, while a visit to the GP or GP-cooperative is always free. For most patients the GP or GP-cooperative is closer to home than the ED. However, patients have to call and make an appointment before they can visit a GP or GP-cooperative, whereas the ED is freely accessible.

Participants

We recruited a purposive sample of self-referred patients in the ED. We aimed to include patients from different age groups, gender, and ethnicities, attending at different times and shifts. Patients were asked to participate and were provided with a letter of information about the study. After reading this, they had the possibility to ask for additional information concerning the study. We obtained written informed consent before patients entered the study. Patients younger than the age of 12 years could only be included, when both parents were in the ED and signed the consent form. Patients between the age of 12 and 16 years had to sign the consent form themselves in addition to both parents signing the form. Patients not speaking Dutch or not mentally able to participate in the interview were excluded. Patients who were in need of urgent care were treated first, before being asked to participate. Additional patients were included until no new reasons for attending the ED were found (ie, saturation was reached).

Interviews

After discussion within the group of authors and review of the literature, an interview topic guide was created. The interview topic guide contained items about the reasons to visit the ED directly, the living and working situation of patients, their symptoms, thoughts concerning their symptoms (severity, probable diagnosis, self-care, and opinions of others), and the treatment they expected. Additionally, it contained questions about possible obstacles in consulting a GP and previous experiences with their GP or GP-cooperative. The topic guide is shown in Table 1. Practicing cyclic analysis, we reflected upon the topic guide and modified it during the inclusion period.

Table 1 – Topic guide for interviews with self-referred patients in the emergency department

Patient characteristics	
1.	Where do you live? Near the ED / GP / GP- cooperative?
2.	What do you do for a living? What is your highest level of education and/or training?
3.	What is your family composition? (single / living with a partner / married / nursing home etc.)
Symptoms (perception)	
4.	What is the reason for your ED-visit (symptoms)?
	a. Can you describe these symptoms?
	b. Since when do you have these symptoms?
5.	What are your thoughts about these symptoms?
	a. Is there a specific condition you are thinking of? What do you think is wrong? What do you think is causing the symptoms?
	b. What do you think of the severity of the symptoms? Is it necessary you are examined urgently? Why? What do you think that can go wrong? How long do you think you can wait with these symptoms?
	c. Are you worried about these symptoms? Do the symptoms affect you emotionally? (do they make you feel scared, angry, confused, depressed etc.)
	d. What are the consequences of these symptoms for you? In what extent are the symptoms influencing your life?
	e. Did you try to do anything about your symptoms? What have you tried? What was the effect?
	f. What do you expect that needs to happen at the ED? (diagnostics, treatment)
	g. Do you think the symptoms are treatable? How much can you do yourself to affect the symptoms?
	h. How long do you think the symptoms will last?
6.	Did you talk to others about your symptoms?
	a. With who? What was their advice? (consult GP/ ED?)

Access to primary care
7. Did you try to contact your GP or the GP-cooperative?
a. If no: Why not? Do you know how to get in contact with the GP or the GP-cooperative? Do you think the ED is the best place to visit? Why?
b. If yes: When? Could you get an appointment? Within what time frame? What did you think about that?
8. Have you visited your GP before with these symptoms? Did he/she give you advice on what to do when the symptoms persisted or got worse?
9. Do you know your GP well? Do you see him/her often?
10. Are you content with your GP? Do you trust him/her?
11. Are you familiar with the existence of a GP- cooperative?
a. If yes: Did you go there before? How was your experience?
Choice of ED
12. Why did you visit the ED without a referral? (and why did you not consult your GP?)
13. What do you expect from a consultation at the ED? What are the advantages compared to a consultation with your GP or GP-cooperative?
14. Have you visited an ED before?
a. If yes: This ED or elsewhere? How was your experience? Did this contribute to visiting the ED today?
15. Are you being treated in this hospital?
a. If yes: With what specialty? Did this contribute to visiting the ED today?
16. Where would you go the next time, with similar symptoms? Why?

The interviews were performed face-to-face in the ED, while the patient was waiting to see a doctor or for results of investigations to return. The interviews lasted between 15 and 45 minutes. All interviews were recorded on an audio recorder, transcribed verbatim, and anonymized. All interviews were conducted by a final year medical student (L.W.).

Additional data

After the interview was completed, additional information from the electronic medical record was obtained: age, gender, time of presentation, reason for presentation as recorded by the triage nurse, Manchester Triage Category [15], specialty, laboratory testing, radiologic imaging, diagnosis, treatment, and admittance to the hospital. These data were used for descriptive purposes.

Analysis

The interviews were analyzed using the framework analysis approach. [16] By repeatedly reading the transcripts of the interviews, 2 authors (N.K. and L.W.) familiarized themselves with the data. They independently highlighted relevant issues and coded

these. Subsequently, the 2 authors met and jointly combined the codes into meaningful clusters. These clusters were then categorized into themes to build a framework of reasons for self-referral to the ED. Characteristic quotes were used to illustrate the acquired theoretical framework.

RESULTS

Patient characteristics

We interviewed 30 patients after which saturation was reached. Twenty-six other patients were asked, but refused to be interviewed. The main reason for refusal was feeling too sick or having too much pain.

The characteristics of the participants are shown in Table 2. Most of the participants were male (63%), with a mean age of 46 years. The patient sample included patients with different medical problems, men and women of varying ages, patients with different ethnicities, and from variable social backgrounds. This study included 3 patients triaged in Manchester Triage Category "Orange." These patients were diagnosed with respectively pericarditis, visual complaints after flash fire in the eyes, and a dislocated talus. Ten other patients were triaged in category "Yellow"; the remaining patients were triaged in category "Green."

Table 2 – Patient characteristics

Characteristic		Number	Percentage
Sex	Male	19	63.3
	Female	11	36.7
Age	< 18 years	1	3.3
	18 – 40 years	9	30.0
	40 – 60 years	13	43.3
	60 - 80 years	6	20.0
	>80 years	1	3.3
Manchester Triage Category	Red (directly assessed)	0	0
	Orange (assessment within 10 minutes)	3	10
	Yellow (assessment within 1 hour)	10	33.3
	Green (assessment within 2 hours)	17	56.7
	Blue (assessment within 4 hours)	0	0

Characteristic		Number	Percentage
Hospitalisation	Yes	4	13.3
	No	26	86.7
Background	Dutch	26	86.7
	Italian	1	3.3
	Surinamese	1	3.3
	Greek	1	3.3
	Indonesian	1	3.3
Employment	Employed	17	56.7
	Unemployed	2	6.7
	Retired	7	23.3
	On temporary medical leave	2	6.7
	Student/school	2	6.7
Marital status	Single	6	20.0
	Married / living with a spouse	21	70.0
	Divorced / separated	2	6.7
	Child	1	3.3
Reason for visit*	Thoracic pain	3	10.0
	Dyspnea	1	3.3
	Abdominal symptoms	3	10.0
	Hematemesis / hemoptysis / rectal bleeding	3	10.0
	Epistaxis	1	3.3
	Accident	2	6.7
	Musculoskeletal, traumatic	9	30.0
	Musculoskeletal, non-traumatic	1	3.3
	Wound / laceration	7	23.3
	Eye symptoms	3	10.0
Time of presentation	Day shift (8:00-17:00)	25	83.3
	Evening shift (17:00-0:00)	5	16.7
	Night shift (0:00-8:00)	0	0
Weekday/ weekend presentation	Weekday (Monday - Friday)	23	76.7
	Weekend (Saturday - Sunday)	7	23.3

*Three patients had multiple reasons to visit the ED

Themes

Two main themes emerged from the interviews that are important to patients' decisions to attend the ED are as follows: (1) health concerns and (2) practical issues (Table 3).

Table 3 – Themes frequently mentioned by participants as reason for visiting the ED

Themes	Quotes
Health concerns	- *I'm afraid to die. I don't know; I just hope it is not a heart attack and I will fully recover from this.* - *I think I might need surgery, so this would be the place to visit.*
Practical issues	- *They always help you here; you don't have to make an appointment or anything.* - *Because we already were on this side of the city, and I really could not wait another hour. So we went here.*

Health concerns

Anxiety

Several patients were concerned about their health and reported anxiety about the presenting symptoms. Some patients even feared the present condition could be life threatening. One patient was afraid to turn blind.

Male, 45 years, pericarditis (patient 9): I'm afraid to die. I don't know; I just hope it is not a heart attack and I will fully recover from this.

Male, 80 years, Chronic Obstructive Pulmonary Disease (COPD) exacerbation (patient 1): I thought I would choke. I was feeling worse and worse, short of breath.

Male, 33 years, visual complaints after flash fire in eyes (patient 13): I hope I can see normally soon. I can't bear to think there is something wrong with my eyes.

Expecting to need secondary care

Most of the participants wanted or expected to need secondary care. Most patients wanted additional investigations (mainly radiological).

Female, 25 years, 16 weeks pregnant, involved in traffic accident, no traumatic injuries (patient 4): I want an ultrasound, just to hear the heartbeat of the baby, than I will be OK.

Female, 21 years, possible gamekeeper's thumb (patient 23): I would like an X-ray to be made to know for sure if it's fractured; that's only possible at the ED.

Others expected to need a specific treatment, not provided by a GP.

Female, 46 years, abdominal pain (patient 26): I think I might need surgery, so this would be the place to visit.

Male, 74 years, epistaxis (patient 2): Last Friday and Sunday the ENT-doctor cauterized the bleeding. I hope the ENT-doctor will take a look and see the bleeding spot, so he can cauterize it again.

Receiving treatment in the hospital

Several patients were currently receiving treatment in the hospital for the presenting condition and therefore chose to visit the ED.

Male, 52 years, bleeding upper digestive tract (patient 3): My GP probably would have sent me here anyway. My gastroenterologist and my medical records are here.

Practical issues

Perceived easier accessibility of the ED

Several patients chose to attend the ED, because they had the perception that the ED is easier accessible. Patients preferred not having to make an appointment and not having to wait for their appointment. The ED is always open to anyone, without any restrictions. Patients felt that it is more difficult to get a timely appointment with their GP or at a GP-cooperative.

Male, 33 years, olecranon bursitis (patient 20): They always help you here; you don't have to make an appointment or anything. And except for today I never had to wait long.

Male, 65 years, pneumothorax after falling (patient 17): Well, I was pressed for time. Tomorrow, we go on vacation and I wanted to make sure there is nothing seriously wrong. The last couple of days were very busy, and if you have to go to your GP first, that takes a lot of time. So I thought; I'll try the ED.

In addition, several patients had the idea that the nurses in the GP-cooperative were trying to deflect patients and were not willing to help. One patient had an unpleasant

experience with the accessibility of the GP-cooperative during a previous visit and therefore attended the ED.

> *Male, 55 years, sprained ankle (patient 7): I live close to the GP cooperative, but my previous visit there was not pleasant. I had a huge wound on my head, seriously bleeding. So I went there,"..." and they only had an appointment for me two hours later, while there was no one in the waiting room.*

Distance

A few patients were not from the area and stated that they did not know where to visit a GP or GP-cooperative, so they decided to visit the ED.

> *Female, 66 years, back contusion after fall (patient 15): We don't have a GP here, so you have to visit the ED on your own initiative. (Lives in different city)*

Some patients were actually from the area, yet closer to the ED as opposed to their GP or GP-cooperative at that moment and therefore chose to visit the ED.

> *Female, 46 years, myogenic chest pain (patient 12): Because we already were on this side of the city, and I really could not wait another hour. So we went here.*

> *Male, 74 years, abrasion head and laceration hand (patient 28): We were nearby and went straight to the ED. Next time I would also go to the nearest service; this time this was the ED, but when this had happened at home I would have gone to the GP.*

DISCUSSION

Treatment of inappropriate self-referred patients in the ED unnecessarily increases health care costs, because these patients could be treated in a primary care facility at lower costs. It is essential to know the motives for self-referral to have an influence on this patient category. Making use of a qualitative methodology, 2 clearly distinctive main themes playing a role in self-referral were identified: (1) health concerns and (2) practical issues. The division of these 2 reasons was not this clearly stated in previous studies.

Only a few qualitative studies researched motives for self-referral to an ED, although these studies solely included patients with nonurgent conditions. Several different reasons for self-referral were found, including the following: unable to obtain an appointment with a GP in a timely manner; the easier availability of the ED versus alternative care; to alleviate pain or discomfort and obtain reassurance; the need for a second opinion or follow-up care; a worrisome condition; and the preference for the ED's facilities or staff. [7,17,18] Grant et al [18] only included parents self-referring to the ED with their children; Guttman et al [17] included adults and children.

All the reasons found in previous qualitative studies fit into the 2 themes found in the current study: health concerns and practical issues. Despite including patients in urgent triage categories, this study did not find completely new motives. Since previous studies excluded patients in urgent triage categories, the reasons found in previous studies were more often practical. The reasons for self-referral found in previous questionnaire studies also can be divided into the 2 main themes our study found. [4,5,8–13]

To the best of our knowledge, this is the first qualitative study also including patients in urgent triage categories that focused on motives for self-referral to the ED. This gives a better representation of the perceptions of the entire scope of self-referred patients in the ED.

Within the category of patients that visited the ED because of health concerns, several patients experienced the fear of severe or life-threatening conditions. These patients were indeed all diagnosed with a serious illness or trauma. Within this category were also patients with the expectation to need secondary care, which was often the case. This is consistent with our findings in a previous study, indicating that 48% to 59% of ED visits by self-referred patients are appropriate. [2] This means that a large number of self-referred patients are in need of secondary care. This suggests that refusing self-referred patients in the ED might lead to missed diagnoses or even an increase in adverse events. Other patients visited the ED mostly out of practical concerns, regarding the perceived easier accessibility or distance to the ED.

In the Netherlands, there is an increasing collaboration between EDs and GP-cooperatives over the last years. Emergency Care Access Points are created; during out-of-office hours patients register at a conjoint desk, from where they are triaged to be seen at the ED or by a GP. This system is associated with a decrease in self-referred ED patients. [19] This system takes away the responsibility of patients to seek the appropriate type of care for their symptoms and shifts it to a medical professional. Patients in need of acute,

secondary care will be examined at the ED, and the remaining patients will be examined by a GP. This means that self-referred patients that visit the ED because of practical reasons will be treated at the appropriate department. This policy has the potential to significantly reduce the number of inappropriate self-referred patients and associated costs, without creating barriers for patients to seek urgent medical care if needed. However, the efficacy of this policy remains to be investigated.

Limitations

Despite of attempting to include a broad range of patients, we did not succeed in including many children, patients visiting during nightshifts and patients triaged in Manchester Triage Category "Blue." We had problems including children, because the presence of both parents was required. Patients self-referring during nightshifts were often under the influence of alcohol or drugs, so they could not be interviewed. Further, in our ED we have very few patients triaged in the "Blue" category: only 1.1% during the inclusion period, so it was difficult to include patients from this triage category. Furthermore, we did not include patients who were unable to speak Dutch. It would have been interesting to also include these patient categories, because it is possible that they have different motives for attending the ED without a referral.

CONCLUSION

This is the first qualitative study also including patients in urgent triage categories that researched motives for self-referral to the ED. Patients self-refer to the ED, either because of health concerns or because of practical motives. Patients visiting the ED mostly out of practical concerns are probably most proper for being redirected through a conjoined triage point, where a medical professional decides whether the patient belongs in primary or secondary care.

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CHAPTER 5

Self-referrals in a Dutch Emergency Department: how appropriate are they?

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Eur J Emerg Med. 2016 Jun;23(3):194-202

ABSTRACT

Objective

Self-referred visits account for an average of 30% of all Emergency Department (ED) visits in the Netherlands. Some of these are considered inappropriate, because patients receive care that a GP can provide. Worldwide, studies have used various methods to determine the proportion of inappropriate visits by self- referred patients, resulting in diverging percentages. The aim of this study was to find a reliable percentage of appropriate visits to the ED by self-referred patients in the Netherlands.

Methods

This observational, prospective study was performed in the ED of a hospital in the Netherlands. Data were collected on all self-referred patients in four separate months over one year. The appropriateness of an ED visit was determined at two time points: first, after primary assessment of the patient, using predefined criteria, and second the moment the patient left the ED, on the basis of the diagnosis and treatment received. Finally, the perspective of the patients was taken into account using a questionnaire.

Results

In four months 3196 self-referred patients were included. In all, 1862 (58.8%) visits were classified as appropriate according to the predefined criteria. When the second time point was taken into consideration, 48.1% of the patients had a secondary care diagnosis and/or needed secondary care treatment, classifying their visits as appropriate. According to the opinion of the patients 76.7% classified their visit as appropriate.

Conclusion

The percentage of appropriate ED visits by self-referred patients in the Netherlands ranges from 48.1 to 58.8%, as determined using two different methods.

INTRODUCTION

Emergency Departments (EDs) in the Netherlands are faced with progressive crowding. The number of ED visits in the Netherlands has remained rather stable over the past years (estimated 1.9 – 2.2 million visits in 2009 and 2079172 visits in 2012) [1]; yet, the number of EDshas decreased, with 106 EDs in 2005 and only 94 EDs in 2013 [2]. ED crowding can lead to delaying urgent care to patients [3 -5]. Previous literature mentioned unnecessary ED visits, boarding of patients (keeping emergency patients who have been admitted to the hospital in the ED) and increased frequency of ordering diagnostic tests and treatment as major causes [3–7].

In the Netherlands, where there is a well-developed primary care system, the debate on crowding mainly concentrates on patients visiting the ED without a referral from their GP. Politicians and stakeholders in healthcare show increasing interest in self-referred ED visits, investigating methods to reduce costs. A recent study found that self-referred visits account for an average of 30% of all ED visits. However, depending on factors such as location, there is a wide range in this percentage between different EDs [1]. Some of the self-referred ED visits are considered inappropriate and unnecessarily expensive, because patients receive care that a GP can provide at lower costs [7–9]. This concept, however, is based on only a few, methodologically weak, Dutch studies.

In the Netherlands, patients can visit their own GP during working hours, whereas in out-of-office hours they can consult a GP at a GP cooperative. The GP will then decide whether the patient needs to be referred to a hospital ED. Some patients, however, decide to go directly to the ED.

In the Dutch healthcare system, people are obligated to have health insurance. In 2008 a deductible was introduced to reduce healthcare costs. When introduced in 2008 the deductible was €150, which gradually increased over the years to €360 in 2013. This deductible, however, does not apply to care provided by a GP, and when someone reaches their deductible amount additional medical visits (including ED visits) are completely covered by medical insurance. Despite these measures, the number of ED visits has not decreased over the past years and it is unclear whether the number of unnecessary visits has.

Worldwide, previous studies have used various criteria and methods to define inappropriate (nonurgent) ED visits by self-referred patients, resulting in diverging percentages of inappropriate visits [10]. Previous studies, for instance, have focused on the triage

category (using different triage systems) [11–14], on predefined criteria (mainly with emphasis on diagnostic workup and performed treatment) [5,7,9,15–19] or on the opinion of various medical professionals [8,20–24].
The aim of this study was to find a reliable percentage of appropriate ED visits in a non-selective group of self-referred patients in the Netherlands. To determine the percentage of inappropriate visits, this study explored three methods: first, a set of predefined criteria was used; second, the diagnoses and performed treatment in the ED were considered; and finally the perspective of the patients was taken into account.

METHODS

After a review of the literature, three different methods were developed to define the appropriateness of ED visits by self-referred patients. The appropriateness of an ED visit was determined by two different methods at two different time points: first, after the primary assessment of the patient in the ED, using predefined criteria, and second at discharge, on the basis of the diagnosis and treatment received. Finally, the perspective of the self-referred patients was measured using a questionnaire.

Study setting

This observational, prospective study was conducted in the ED of the Rijnstate Hospital in Arnhem, a 955-bed community teaching hospital in the eastern part of the Netherlands. This ED covers an area of 460 000 inhabitants and had 36 721 visits in 2012, of which 12.383 (33.7%) patients were hospitalized. The ED is staffed 24/7 by a team working in shifts, consisting of nine emergency physicians and 27 emergency medicine residents.
After approval from the local ethics committee, all self-referred patients visiting the ED were included in the study: the term 'self-referred' indicates that the patient attended the ED on his or her own initiative, without a referral from a GP, and was not brought in by an ambulance. No exclusion criteria, such as age, were used. Patients were included in four separate months (April, July and October of 2012 and January of 2013) to avoid bias based on seasonal variation.
All data were prospectively collected and included basic demographics and details of the ED visit: Manchester triage category; order of laboratory investigations; order of radiological investigations; final diagnosis; treatment received in the ED; and follow-up.

Methods to determine appropriateness

For the first method, objective criteria were defined to differentiate appropriate from inappropriate ED visits. These criteria classified as appropriate those visits to the ED by self-referred patients who needed urgent diagnostic testing or treatment that could only be performed in a hospital (Table 1). Visits of self-referred patients who did not need these testing modalities or did not need hospital treatment were classified as inappropriate. The predefined criteria were applied after the primary assessment in the ED. The criteria were not known to the treating physician.

Table 1 – Criteria determining the appropriateness of the ED-visit.

Secondary care (appropriate)	Primary care (inappropriate)
Laboratory investigations	Urine testing only
ECG	
Immediate radiological investigations (X-ray, CT, ultrasound, MRI)	
Extensive wounds that needed follow-up in a specialist office	Simple suture wounds, that did not need follow-up or could be followed-up by a GP
Complications / symptoms related to previous hospital treatment	
Indication for surgery	
Hospital admission	

For the second method, diagnoses of and treatments given to all included patients were analysed. The diagnoses were classified following the 10th edition of the International Statistical Classification of Diseases and Related Health Problems, developed by the WHO (ICD-10 classification) [25]. Two emergency physicians (D.R. and N.D.) determined which diagnoses should be taken care of in the ED and which could be handled in primary care. The emergency physicians independently classified the diagnoses and subsequently compared their results, reaching consensus.

The different treatments were classified into categories. Two emergency physicians (D.R. and N.D.) differentiated between treatments requiring hospital facilities and treatments that could be performed in a general practice.

Subsequently, the classifications of diagnosis and treatment were combined. Patients who received a diagnosis and treatment that could have been handled by a GP were classified as inappropriately visiting the ED. Patients who received a diagnosis and/or treatment that required hospital facilities were classified as appropriately visiting the ED.

Questionnaires

Finally, the subjective perspective of self-referrals was taken into account. Questionnaires were offered to all self-referred patients to evaluate the patients' perception of the appropriateness of their visit to the ED. This questionnaire included the question on where patients would seek medical care if confronted with similar complaints. They could choose from an ED visit, consulting a GP or getting no medical help. Before patients filled out the questionnaires, informed consent was obtained. When patients were under the age of 12, caretakers were asked to fill in the questionnaire.

Analysis

The anonymous data were analysed using SPSS Statistics (SPSS Inc. PASW Statistics for Windows, version 18.0, Chicago, USA). Descriptive statistics were used to describe sex, age, triage categories and ICD-10 categories. To compare dichotomous or categorical variables the Pearson $\chi 2$-test was used. When more than 25% of the cells had a value below 5, the Fisher exact test was used. When this was not possible, because of a large amount of cells, the Monte-Carlo method was used. A P-value less than 0.05 was considered significant.

RESULTS

A total of 12409 patients visited the ED during the inclusion period; 3196 (25.8%) patients were self-referrals and were included in this study. Demographic data are shown in Table 2.

The majority of the self-referred patients were male (58.7%) and most self-referrals were under the age of 40 years. More than half of the ED visits were classified as triage category 'green'. Using the ICD-10, 472 different diagnoses were registered. Injuries (e.g. lacerations, distortions and fractures) accounted for over 60% of reasons for self-referred patients to visit the ED. Other frequent symptoms were abdominal pain and chest pain.

Outcomes

Applying the predefined criteria from the first method to the ED visits, 1878 (58.8%) patients received secondary care. The other 1318 (41.2%) patients could have received

the same level of care from a GP. Figure 1 shows how the predefined criteria were used to classify the self-referrals.

Figure 1 – Applying the predefined criteria to the self-referred patients.

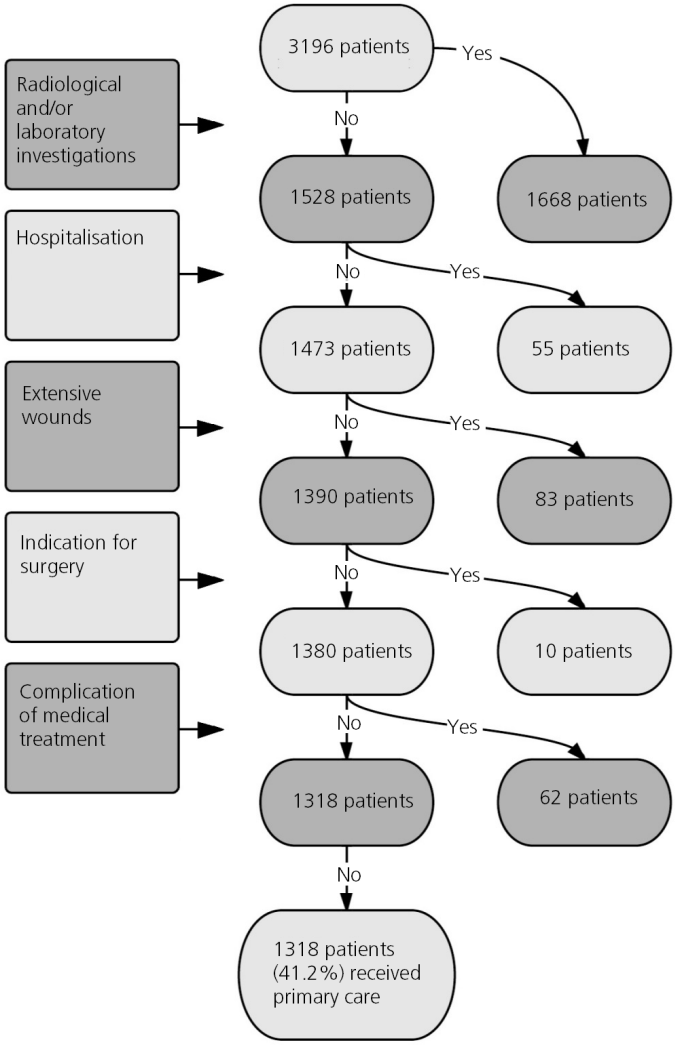


Table 2 shows which patient categories most often self-refer inappropriately, according to the predefined criteria. Male patients visit the ED inappropriately more often, compared with female patients. Concentrating on age categories, patients between 18 and 29 years account for most inappropriate visits, whereas patients between 80 and 89 years

account for the lowest number of inappropriate visits. There is a significant relationship between Manchester triage category and appropriateness of an ED visit: the less acute a visit was triaged, the more often it was inappropriate. Most self-referrals, almost a fifth, visited the ED on Sunday.

Table 2 – Demographics and characteristics of self-referred patients and their ED-visits versus appropriateness.

Category	Subcategory	N(%)	Appropriateness		Significance
			Inappropriate (%)	Appropriate (%)	
Gender	Male	1875(58.7)	816(43.5)	1059(56.5)	P=0.001
	Female	1321(41.3)	503(38.1)	818(61.9)	
Age group	0 years	26(0.8)	13(50.0)	13(50.0)	P<0.001
	1-3 years	136(4.3)	72(52.9)	64(47.1)	Age: Mean: 34.0 Std. Error: 0.4 Std. Dev: 20.4
	4-12 years	310(9.7)	139(44.8)	171(55.2)	
	13-17 years	225(7.0)	82(36.4)	143(63.6)	
	18-29 years	832(26.0)	398(47.8)	434(52.2)	
	30-39 years	476(14.9)	225(47.3)	251(52.7)	
	40-49 years	442(13.8)	152(34.4)	290(65.6)	
	50-59 years	336(10.5)	112(33.3)	224(66.7)	
	60-69 years	224(7.0)	76(33.9)	148(66.1)	
	70-79 years	122(3.8)	35(28.7)	87(71.7)	
	80-89 years	60(1.9)	14(23.3)	46(76.7)	
	90-99 years	7(0.2)	1(14.3)	6(85.7)	
Manchester triage category	Red	2(0.1)	1(50.0)	1(50.0)	P<0.001
	Orange	178(5.6)	20(11.2)	158(88.8)	
	Yellow	1189(37.2)	370(31.1)	819(68.9)	
	Green	1787(55.9)	904(50.6)	883(49.4)	
	Blue	28(0.9)	21(70.0)	9(30.0)	
	Empty	12(0.3)	3(30.0)	7(70.0)	
Day of the week	Monday	489(15.3)	177(36.2)	312(63.8)	P=0.039
	Tuesday	435(13.6)	167(38.4)	268(61.6)	
	Wednesday	421(13.2)	192(45.6)	229(54.4)	
	Thursday	361(11.3)	148(41.0)	213(59.0)	
	Friday	398(12.5)	182(45.7)	216(54.3)	
	Saturday	483(15.1)	200(41.4)	283(58.6)	
	Sunday	609(19.1)	253(41.5)	356(58.5)	

Category	Subcategory	N(%)	Appropriateness		Significance
			Inappropriate (%)	Appropriate (%)	
ICD-10 Diagnostic groups	I – Infections	59(1.8)	32(54.2)	27(45.8)	P<0.001
	II – Neoplasms	1(0.03)	0(0.0)	1(100)	
	III – Blood	2(0.06)	0(0.0)	2(100)	
	IV – Endocrine, metabolic	3(0.09)	0(0.0)	3(100)	
	V – Mental	35(1.1)	24(68.6)	11(31.4)	
	VI –Nervous system	30(0.9)	16(53.3)	14(46.7)	
	VII – Eye	32(1.0)	31(96.9)	1(3.1)	
	VIII – Ear	22(0.7)	17(77.3)	5(22.7)	
	IX – Circulatory system	61(1.9)	14(23.0)	47(77.0)	
	X – Respiratory system	86(2.7)	31(36.0)	55(64.0)	
	XI – Digestive system	98(3.1)	38(38.8)	60(61.2)	
	XII – Skin	56(1.8)	38(67.9)	18(32.1)	
	XIII – Musculoskeletal system	140(4.4)	81(57.9)	59(42.1)	
	XIV – Genitourinary system	54(1.7)	14(25.9)	40(74.1)	
	XV – Pregnancy	3(0.09)	2(66.7)	1(33.3)	
	XVI – Perinatal	2(0.06)	0(0.0)	1(100)	
	XVII – Congenital	1(0.03)	0(0.0)	1(100)	
	XVIII – Symptoms, abnormal lab findings	356(11.1)	107(30.1)	249(69.9)	
	XIX – Injury, poisoning	1983(62.0)	802(40.4)	1181(59.6)	
	XX – External causes	119(3.7)	48(40.3)	71(59.7)	
	XXI – Factors influencing health	53(1.7)	24(45.3)	29(54.7)	

For the second method the diagnoses and received treatments were taken into account.

Classification by diagnosis

All 472 different diagnoses (coded according to the ICD-10) were classified into three groups: a group of diagnoses that could be treated in primary care; a group of diagnoses that needed care in the ED; and a group of diagnoses that could not be classified. A total of 196 diagnoses that required secondary care were found, representing 1155 (36.1%) ED visits. There were 260 diagnoses that could have been managed in primary care, by a GP, representing 1975 (61.8%) visits. There were 16 diagnoses that could not be classified into ED or GP diagnoses, representing 66 (2.1%) visits.

Classification by received treatment

All categories of treatments performed in the ED were classified into two categories: treatments that could have been performed in a general practice or treatments that could only be performed in a hospital. Of all included patients, 2150 (67.3%) patients received treatment that could have been performed by a GP. The other 1042 (32.6%) patients needed treatment in the hospital; for four patients the treatment was not registered. These results are shown in Table 3.

Table 3 – Treatments received in the ED.

Treatment	Total	Primary care	Secondary care
Wait-and-see, pain medication	917	917	0
Bandage	492	492	0
Cast	225	0	225
Reduction (dislocation, fracture)	86	0	86
Simple wound treatment (steristrips, glue)	193	193	0
Extensive wound treatment (stitches, debridement, flammazine)	422	0	422
Prescription of new medication	306	306	0
Eye crème	34	34	0
Change of tube/catheter	20	20	0
Hospitalization	266	0	266
Hospitalization and surgery	43	0	43
Referral to outpatient clinic	164	164	0
Patient left without treatment	24	24	0
Unknown, not registered	4	0	0
Total	**3196**	**2150**	**1042**
	100%	**67.3%**	**32.6%**

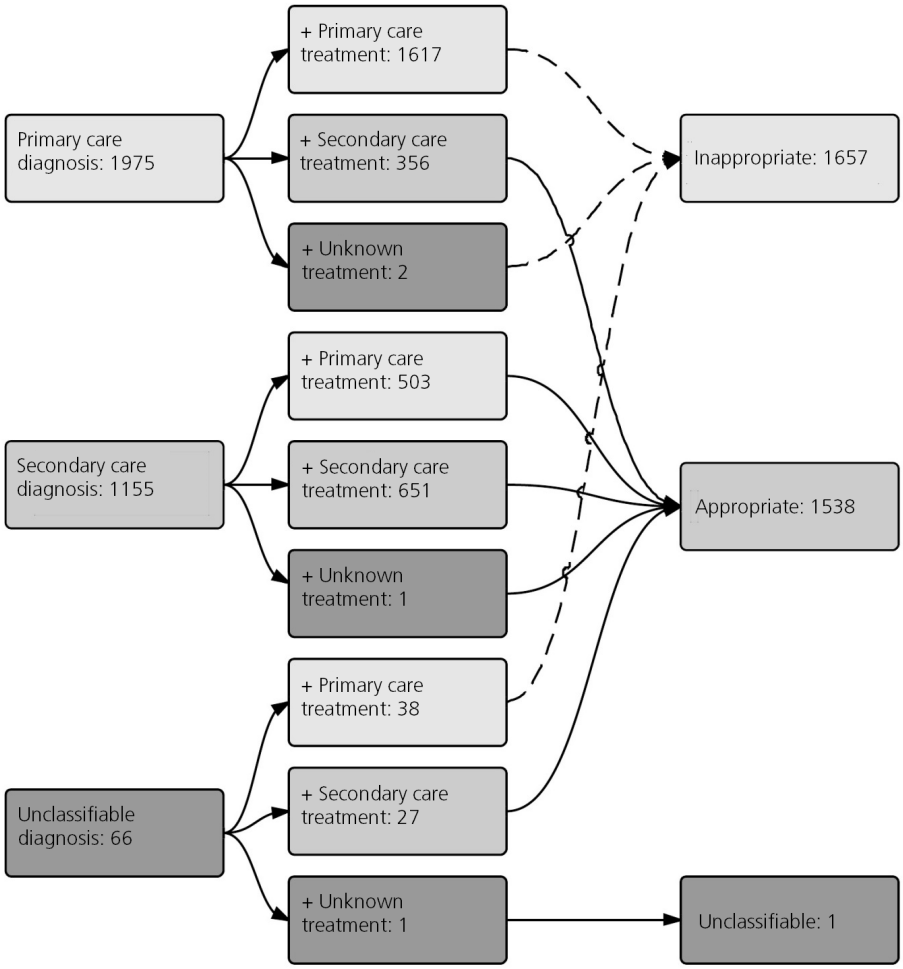
Note: The total number of patients that received primary or secondary care is 3192 (and not 3196), because the treatment of four patients was not registered.

Classification by a combination of diagnosis and treatment

The classifications of the diagnoses and treatments were then combined; this is shown in Figure 2. Combining these outcomes, just over half of the self-referred patients (1617 patients, 50.6%) had a primary care diagnosis and needed only primary care treatment. These patients were therefore identified as visiting the ED inappropriately. Almost half of the self-referrals (48.1%, 1538 patients) had a secondary care diagnosis and/or needed secondary care treatment. This group of patients needed some form of secondary care,

and was therefore classified as appropriately visiting the ED. The remaining patients had a nonclassifiable diagnosis combined with primary care treatment (38 patients, 1.2%) or had a primary care diagnosis with unknown treatment (two patients, 0.06%) and were classified as inappropriate. One patient had a nonclassifiable diagnosis and underwent an unknown treatment.

Figure 2 – Combination of diagnosis and treatment



Note: Patients, who received either a secondary care diagnosis or a secondary care treatment, were classified as appropriately visiting the Emergency Department. Patients, who only received a primary care diagnosis and primary care treatment, were classified as inappropriately visiting the Emergency Department.

Opinion of self-referrals

For the third approach, the self-referred patients were asked whether they would visit the ED again if confronted with similar complaints, using a questionnaire handed out during the ED visit. The response rate to this question was 44.1% (1408 patients).

Of the patients who answered this question 1105 (76.7%) patients reported that they would visit an ED again, 320 (22.2%) patients reported that they would visit a GP and 16 (1.1%) patients reported that they would seek no medical help. Thirty-seven of these patients selected multiple answers.

Of the patients who answered that they would visit an ED again if confronted with similar complaints, 62% were found to be appropriately visiting the ED according to the predefined criteria. Of the patients who answered that they would visit a GP next time, 45% were appropriately visiting and of the small group of patients who would seek no medical help only 31% were appropriately visiting the ED.

DISCUSSION

The aim of the present study was to determine the proportion of inappropriate visits of self-referred patients to the ED of a large community teaching hospital in the Netherlands using different methods. We found that the percentage of appropriate visits by self-referred patients ranged from 48.1 to 58.8%; 76.7% of the self-referred patients would again attend an ED if confronted with similar complaints.

Studies on the appropriateness of self-referred patients have been performed all over the world. These studies have used various methods, resulting in divergent percentages of inappropriate visits. In particular, Dutch research made use of a mainly subjective approach, limited numbers of criteria and selected patient categories.

This study used a set of predefined criteria. With these criteria it was determined that 58.8% of the self-referrals appropriately visited the ED. Prior studies have also used predefined criteria to determine the appropriateness of self-referred patients, including two Dutch studies. However, in contrast to these studies, the present study used multiple predefined, unambiguous criteria to achieve an objective estimate on the percentage of appropriate self-referrals, a method less susceptible to bias. The criteria used in previous studies varied, but the majority concentrated on diagnostic procedures and treatment performed in the ED [5,7,9,15–19]. Among these studies the resulting percentages of

inappropriate ED visits by self-referrals varied from only a small proportion of 7.3% [16] to the majority of visits with 61% [18]. These studies, however, used only limited numbers of criteria, possibly leading to an underestimation of the proportion of appropriate visits. Our study combined predefined criteria with a retrospective review, which concentrated on the diagnosis and treatment that patients received. With this method we found that 48.1% of the self-referrals appropriately visited the ED. To the best of our knowledge, no previous studies used a similar combination of a set of predefined criteria and a retrospective review. A retrospective review was used in a few previous studies [9,17]. Netten and colleagues based their judgement on the follow-up received by patients. In total, 60% of self-referrals were referred back to their GP and therefore classified as inappropriately visiting the ED. On the basis of selected ICPC-2 codes, Bardelli and colleagues identified 29.9% as nonurgency ED visits. (ICPC stands for 'International Classification of Primary Care' and is a standard tool to code and classify symptoms and diagnoses in primary care.)

Additional methods were used in previous studies. Several studies used triage to determine the percentage of nonurgent ED visits by self-referred patients [11–14]. The triage systems used varied among the studies and thus results cannot be compared readily. The use of different triage systems resulted in varying proportions of inappropriate self-referrals, ranging from 6.1% [11] to 40.0% [12]. Yet another set of studies based appropriateness on the opinion of medical professionals. Among these studies the type of medical professionals varied, and included medical students [8], triage nurses [20], ED nurses [21], casualty officers [22], one senior A&E consultant [23] or the treating emergency physician [24]. The methods used were subjective, and because of the opinion-based nature there was a risk of interobserver bias. Again, these studies resulted in diverging percentages of inappropriate visits, ranging from a minority of 19.7% [23] to a striking 80.2% [8]. In contrast, our study was not opinion based and solely made use of objective predefined criteria.

In contrast to some previous studies [7,9,12,17,18], this study made use of broad inclusion criteria: every patient without a referral was included, regardless of age or presenting complaint.

Opinion of self-referred patients

Our study found that a striking 76.7% of self-referred patients would visit the ED again if they were confronted with similar symptoms. This percentage is consistent with previous literature [26,27]. In contrast to prior studies, self-referred patients were given questionnaires when they were still in the ED. This implies that patients did not have to search their memory for the details of their ED visit, and thus they could provide a more reliable answer.

Limitations

The most important limitation of using predefined criteria is that this method can possibly lead to an overestimation of the number of appropriate visits, because physicians working in the ED may order more investigations than a GP would with the same patient and symptoms. In contrast, a method that considers only diagnosis and the given treatment will lead to an underestimation of the percentage of appropriateness because laboratory or radiological investigations can be necessary to rule out (life threatening) problems and come to a primary care diagnosis.

Another limitation of this study is that there may be interobserver bias. Different physicians working in the ED may order different investigations with a similar complaint, which can lead to different outcomes using the predefined criteria. These individual variations are not completely avoidable in daily practice and the effect on the percentage of appropriateness is not clear.

For the second method used, considering diagnosis and treatment, two emergency physicians determined which diagnoses and treatments belonged in the ED. To achieve a broader perspective on this subject it would have been possible to include the opinion of GPs.

The response rate to the questionnaire we handed out was 44.1%, which is relatively low. This makes it possible that the included answers are not a reflection of the opinion of all self-referred patients. The likely reason for this low response rate is that the distribution of the questionnaires was an extra task for the already busy ED nurses and residents, leading them to prioritize other tasks and forget to hand out the questionnaires.

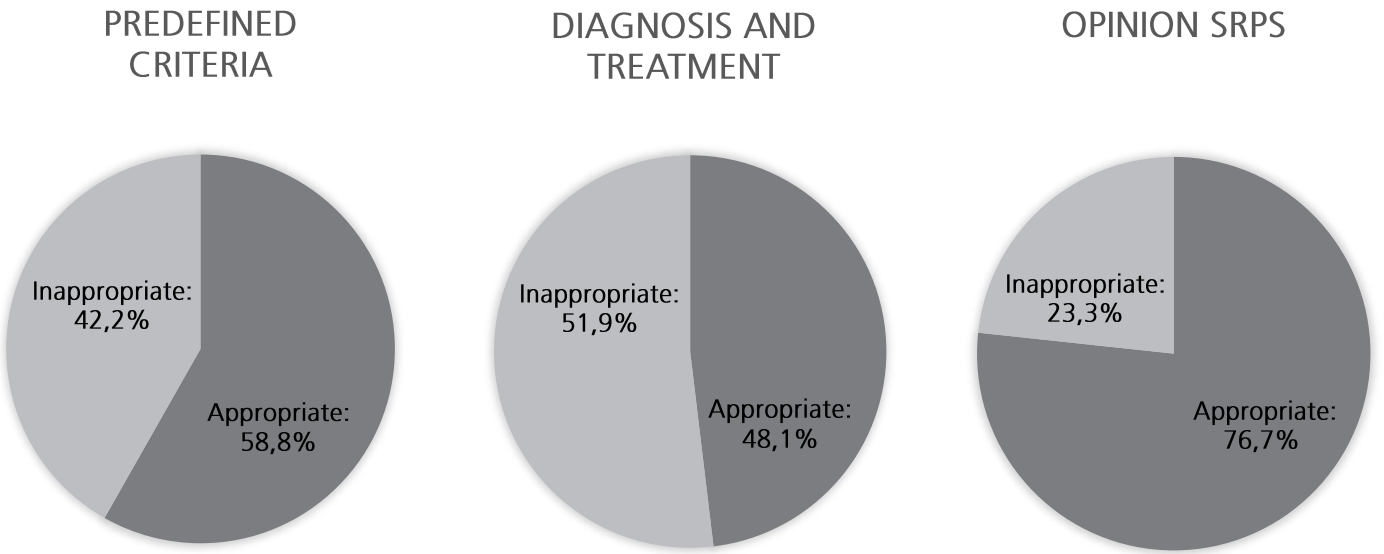
This study was performed in one ED. This limits the possibility of extrapolating the results to EDs in the rest of the Netherlands.

CONCLUSION

In the ED of a Dutch Community Teaching Hospital the percentage of appropriate visits by self-referred patients measured by different methods ranged from 48.1 to 58.8%; 76.7% of the self-referred patients reported that they would again attend an ED if confronted with similar complaints.

Figure 3 shows the outcomes of the different methods to determine the appropriateness of the self-referred patients.

Figure 3 – Percentage of self-referred patients appropriately visiting the ED. Results of the three different methods used to determine the percentage of appropriate visits to the ED by self-referred patients.



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CHAPTER 6

Introducing copayments in the Emergency Department would deter appropriate visits in the Netherlands

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Eur J Emerg Med. 2018 Apr;25(2):147-152

ABSTRACT

Objective

To determine what the effects of introduction of copayments for self-referred Emergency Department (ED) visits would be in the Netherlands and at what amount patients would turn to a GP before visiting an ED.

Methods

This questionnaire study was carried out in the ED of the Rijnstate Hospital, a community teaching hospital in the Netherlands. In the Netherlands, a deductible excess system is in use and this study investigated the effects of a copayment for self-referred patients (SRPs) on top of the deductible excess. A questionnaire was developed and handed out to SRPs.

Results

A total of 433 SRPs were included; their average age was 33.1 years and 63% were male. With a copayment of €100, 47% of SRPs would choose to visit their GP instead of the ED. A further increase in the copayment amount is largely ineffective in reducing the number of self-referred ED visits. The higher the household income and education level and the more urgent the triage category, the larger the copayment patients are willing to pay. There is no significant relation between appropriateness and the amount of copayment that patients are willing to pay and we found no specific copayment level that resulted in reducing mainly inappropriate ED visits.

Conclusion

With a copayment of € 100, 47% of the SRPs would choose to visit their GP instead of the ED. There was no specific copayment level that resulted in reducing mainly inappropriate ED visits.

INTRODUCTION

In the Netherlands, patients have 24/7 access to primary care. During the day, they can visit their personal GP; during out-of-office hours, patients can visit a GP-cooperative. The GP can then decide whether more specialized acute medical care is deemed necessary and can refer patients to the Emergency Department (ED). However, a large number of patients choose to visit the ED without referral. An average of 30% of ED patients in the Netherlands are self-referred [1]. Even though there is no consensus on the impact, this is associated with overtreatment, overcrowding, and longer waiting times in EDs. Consequently, this results in higher healthcare expenditure [2,3].

Every Dutch citizen is obliged to have health insurance. To reduce healthcare costs, a deductible excess of €150 was introduced in 2008. This amount was increased to a minimum of €375 a year in 2015. Patients could choose to increase their deductible excess to a maximum of €875 a year, with a reduction in their insurance premium in return. When the deductible excess is not reached, medical visits (including ED visits) are charged to the patient. After reaching the deductible excess, additional medical visits are fully covered by medical insurance. GP care is excluded from this, and thus is always free of charge. Children under the age of 18 years do not have a deductible excess.

With 10.8%, the Netherlands is one of the countries with the highest percentage of gross domestic product spend on healthcare [4]. In 2013, the Dutch Minister of Health considered the introduction of a copayment of €50 for patients self-referring to the ED to reduce healthcare costs. Because of legal obstacles and difficulties with implementation, this plan was not implemented [5].

The aim of this study is to determine the effect of an introduction of copayments for self-referred ED visits in the Netherlands and at what copayment level patients would refrain from visiting the ED directly.

METHODS

In the Netherlands, a deductible excess system is in use. An additional copayment would be for self-referred ED visits only and would be applicable whether or not the deductible excess has been reached. This questionnaire study was carried out in the ED of the Rijnstate Hospital in Arnhem, an 887-bed community teaching hospital in the Netherlands. This ED

covers an area of 450 000 inhabitants and had 37 806 visits in 2015 (which is 8401 ED visits/100 000 inhabitants), of whom 14 617 (39%) patients were hospitalized. The ED is 24/7 staffed by emergency physicians. By Dutch standards, this is an average-sized to large-sized ED [1]. The study was approved by the local ethics committee.

After review of the literature and discussion with the authors, a questionnaire was developed. For parents visiting with their child under the age of 16 years, the questionnaire was slightly modified. The main question was at which copayment level patients would choose to visit the GP instead of the ED when confronted with similar symptoms. The questionnaire also yielded questions on insurance, costs of medical visits, household income, and level of education.

Self-referred patients (SRPs) were handed a questionnaire at the time they arrived at the ED and they handed in the questionnaire at the end of their ED visit. Patients were considered 'self-referred' when they attended the ED on their own initiative, without a referral from a GP, and not brought in by an ambulance. A power calculation (on the basis of 11 000 SRPs/year visiting the ED, with an error of 5% and a confidence interval of 95%) was used to determine the number of patients needed to make a reliable statement on the copayment level that patients are willing to pay to visit the ED directly; this resulted in the inclusion of 370 patients.

The primary outcome parameter was the copayment level at which patients would refrain from visiting the ED directly. Secondary outcomes are the SRPs' knowledge of their insurance and charges of their medical visit and their opinion on copayments. In addition, basic demographic data and information on the ED visit were collected. All data, including the data from the questionnaires, were anonymized. The charges of each ED visit were ascertained. To determine whether the introduction of a copayment would deter appropriate ED visits, we used predefined criteria from a previous study to determine the appropriateness of the self-referred ED visits (Table 1) [6].

Statistical analysis

The statistical analyses were carried out in IBM SPSS statistics 20 (IBM Corporation, Armonk, New York, USA). For the relation between the copayment level at which patients would visit their GP, versus household income, education, and triage, a Spearman's ρ-test and an ordinal regression analysis were carried out. For the relation between the level of copayment at which patients would visit their GP and the appropriateness of their ED visit, the Pearson $\chi 2$-test was performed.

Table 1 – Predefined criteria determining the appropriateness of an ED-visit

Secondary care (appropriate)	Primary care (inappropriate)
Laboratory investigations	Urine testing only
ECG	
Immediate radiological investigations (X-ray, CT, ultrasound, MRI)	
Extensive wounds that needed follow-up in a specialist office	Simple suture wounds, that did not need follow-up or could be followed-up by a GP
Complications / symptoms related to previous hospital treatment	
Indication for surgery	
Hospital admission	

RESULTS

From 19 March 2015 to 7 July 2015, 12 654 patients visited the ED; 1931 (15.3%) patients were self-referred, of whom 433 (22.4%) patients completed a questionnaire. Inclusion of patients was stopped after 370 patients filled out the question on the copayment amount at which they would primarily turn to their GP. Patient characteristics are shown in Table 2. Most patients visited with musculoskeletal symptoms and lacerations after trauma.

Table 2 – Patient characteristics

		N	Percentage	Total N	Total percentage
Total		433	100	1924	100
Age	Minimum: 0 Maximum: 83	Mean: 33.1 SD 19.5		Mean: 33.6	
Sex	Male	271	62.6	1190	61.9
	Female	162	37.4	734	38.1
Manchester triage category	Red	0	0	3	0.2
	Orange	10	2.3	171	8.9
	Yellow	151	34.9	774	40.2
	Green	271	62.6	951	49.4
	Blue	1	0.2	12	0.6
	No triage	0	0	13	0.7

		N	Percentage	Total N	Total percentage
Investigations	Laboratory	46	10.6		
	ECG	22	5.1		
	X-ray	206	47.6		
	Ultrasound	2	0.5		
	CT	16	3.7		
Hospitalization	Yes	24	5.5		
	No	409	94.5		
Outpatient follow-up	Yes	177	40.9		
	No	256	59.1		
Education	No education	15	3.8		
	Primary education	11	2.8		
	Lower vocational education	37	9.3		
	Secondary vocational education	42	10.6		
	Secondary vocational education Plus	78	19.6		
	Higher secondary education	45	11.3		
	Higher vocational education	82	20.7		
	University	53	13.4		
	Otherwise	6	1.5		
	Denied information	28	7.1		
	Missing	36			
Net income (Euro/month)	<1000	66	16.8		
	1001-1350	34	8.7		
	1351-1800	54	13.7		
	1801-3150	78	19.8		
	>3150	76	19.3		
	Denied information	85	21.6		
	Missing	40			

The average tariff of an ED visit was € 298.34. The lowest price of an ED visit was €206.09 (the basic rate) and the highest price of an ED visit was €4974.75. Thirty-nine percent believed that the charges of their ED visit were lower than they actually were, 42% chose the right price, and 19% believed that the charges of their ED visit were higher than they actually were (107 patients did not answer this question; of 13 ED visits, the costs were missing) (Table 3).

Most patients (63%) had supplementary insurance and 13% did not know how they were insured. Only 7% increased their deductible excess. Thirty percent did not know their deductible excess amount. These percentages are comparable with the percentages

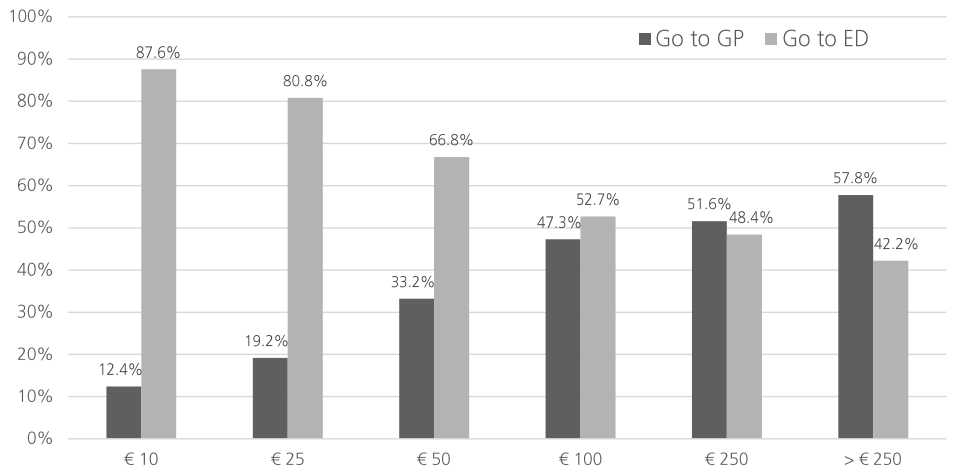
from the Dutch national 'Zorgthermometer' from 2015. Almost half of the patients believed that they would have to pay for their visit to the GP or GP-co-operative. Further, over 30% believed that visiting the ED would be free of charge. This was only true for patients who have already reached their deductible excess that year (Table 3).

Table 3 - Characteristics of insurance, costs and copayment

		N	Percentage	Percentage nationwide [10]
Insurance	Basic	99	23.3	16
	+ supplementary	268	63.2	84
	Don't know	57	13.4	
	Missing 0	9		
Deductible excess amount	375 Euro	264	62.4	88
	475 Euro	4	1.0	1.4
	575 Euro	4	1.0	1.3
	675 Euro	4	1.0	0.7
	775 Euro	1	0.2	0.2
	875 Euro	17	4.0	8.3
	Don't know	129	30.5	
	Missing	10		
Expected costs GP	Free of charge	198	51.6	
	50 Euro	59	15.4	
	100 Euro	61	15.9	
	250 Euro	39	10.2	
	350 Euro	6	1.6	
	>350 Euro	21	5.5	
	Missing	49		
Expected costs ED	Free of charge	114	31.1	
	50 Euro	31	8.4	
	100 Euro	77	21.0	
	250 Euro	66	18.0	
	350 Euro	31	8.4	
	>350 Euro	48	13.1	
	Missing	66		
Introduction copayment ED	Good idea	156	42.2	
	Bad idea	214	57.8	
	Missing	63		

Figure 1 shows at which copayment level SRPs would refrain from visiting an ED directly. With a copayment of €100, 47% would not visit the ED directly. Increasing the level of copayment beyond €100 does not seem to result in much more effect on the number of self-referred ED visits. Forty-two percent of patients stated that their choice to come to the ED directly would not be influenced by a copayment, irrespective of the amount.

Figure 1 – Copayment levels at which patients would choose to visit the GP or the ED.



*370 patients answered this question

The higher the income and education level and the more urgent the triage category, the larger the copayment amount that patients are willing to pay to visit the ED directly. Performing Spearman's ρ, income and education versus copayment level both resulted in a P-value of less than 0.001, with a correlation coefficient of 0.182 for income and a correlation coefficient of 0.214 for education. Triage category versus copayment level resulted in a correlation coefficient of 0.133, with a P-value of 0.01. On carrying out an ordinal regression analysis, the same trend was found for income, education, and triage. However, only triage remained significant within the separate triage categories. Age older than or younger than 18 years did not have a significant influence on the copayment amount that patients (or parents) were willing to pay (Table 4).

Tables 4 – Ordinal regression analysis on relation with amount of copayment self-referred patients are willing to pay to visit the ED directly

			95% Confidence interval		
		Odds ratio	Lower bound	Upper bound	Sig. (P)
Manchester triage category	Green	1.00	-	-	.
	Yellow	1.78	1.09	2.91	0.02
	Orange	9.20	1.09	77.94	0.04
Income a month	< 1000 Euro	1.00	-	-	-
	1001 – 1350 Euro	0.95	0.43	2.13	0.90
	1351 – 1800 Euro	1.12	0.53	2.36	0.76
	1801 – 3150 Euro	1.36	0.68	2.71	0.38
	>3150 Euro	2.29	1.01	5.22	0.05
Education	No education	1.00	-	-	-
	Primary education	1.90	0.32	11.21	0.48
	Lower vocational education	1.91	0.42	8.73	0.40
	Secondary vocational education	2.37	0.52	10.89	0.27
	Secondary vocational education Plus	2.31	0.54	9.92	0.26
	Higher secondary education	2.71	0.58	12.72	0.21
	Higher vocational education	3.44	0.77	15.39	0.11
	University	3.06	0.62	15.21	0.17
Appropriate	No	1.00	-	-	-
	Yes	0.99	0.62	1.57	0.95
Age	Age above 18 years	1.00	-	-	-
	Age under 18 years	1.40	0.80	2.45	0.24

Using the previous defined criteria, we determined whether the self-referred ED visits were appropriate, that is, patients needed secondary care [6]. From the 370 patients who answered the question at what copayment level they would visit the GP, 225 (61%) patients visited the ED appropriately. On carrying out the Pearson χ2-test and ordinal regression analysis, we found that appropriateness was not significantly related to the amount that patients were willing to pay to visit the ED directly (Pearson's χ 2: P = 0.125; ordinal regression: P = 0.95) (Table 4). There was no specific copayment level resulting in mainly patients with inappropriate visits being deterred from the ED. The larger the copayment, the more patients in need of secondary care refrained from visiting the ED directly (Table 5).

Table 5 – Copayment levels at which patients would visit their GP instead of the ED, versus appropriateness

Copayment level at which patients would not visit the ED	Appropriate, number (%)	Inappropriate, number (%)	P-value
€ 250 or less	110 (48.9)	81 (55.9)	P=0.190
€ 100 or less	101 (44.9)	74 (51.0)	P=0.248
€ 50 or less	69 (30.7)	54 (37.2)	P=0.190
€ 25 or less	39 (17.3)	32 (22.1)	P=0.259
€ 10	23 (10.2)	23 (15.9)	P=0.108
Total	225	145	

The Pearson's $\chi 2$ test was performed.

Percentages of total, per category.

There were seven patients with a true emergency, that is, life-threatening events could be expected if they would not have visited the ED within 24 h. These patients suffered from paralytic ileus, bilateral pneumonia and exacerbation of chronic obstructive pulmonary disease, bowel perforation after bariatric surgery, hematemesis, invasive Salmonella infection, non-ST-elevation myocardial infarction, and ST-segment elevation myocardial infarction. No significant relation was found with the copayment amount that these patients were willing to pay (Pearson's $\chi 2$, $P = 0.566$).

DISCUSSION

This study found that depending on the amount, the majority of SRPs in the ED stated that they would primarily visit their GP when a copayment is introduced. At an amount of €100, 47% of SRPs would choose to visit their GP instead of the ED. An increase of copayment above €100 is largely ineffective in further reducing the number of SRPs.
Remarkably, this study showed no correlation between the amount that patients are willing to pay to visit the ED directly and the appropriateness of their visit. This suggests that patients cannot adequately estimate the appropriateness of their ED visit. The introduction of a copayment would inevitably lead to deterring patients from the ED who are in need of secondary care. With increasing copayment levels, progressively more patients in need of secondary care would refrain from visiting the ED. Assuming that these patients would visit the GP or GP-cooperative, this would lead to a delay in diagnosis

and treatment, possible worse outcome, duplication of work, and additional expenses. Further, this suggests that the introduction of an appropriateness-based copayment (only patients with inappropriate ED visits pay extra) would also not deter mainly inappropriate ED visits.

Our study found that the copayment level that patients are willing to pay is related to income; patients with lower incomes would be deterred more easily from the ED than patients with higher incomes. This finding is consistent with previous research [7,9,10]. The question is raised whether the copayment level should be based on the household income to prevent inequality in access to healthcare. However, an income-based copayment would lead to more bureaucracy (with additional expenses) and difficulties in implementation.

The financial regulations and charges in Dutch healthcare are quite complex and often not clear for patients. We found that SRPs are frequently not aware that a consultation of a GP is free of charge. Furthermore, patients are often not well informed on their insurance, deductible excess, and charges of an ED visit. Patients receive an invoice months after they have received healthcare, which makes it difficult to take the charges into consideration when deciding to visit an ED. An out-of-pocket payment for self-referred visits at the time of arrival at the ED would be more apparent. Further, this would make a clear distinction between self-referred and referred visits, whereas the deductible excess has to be paid irrespective of referral. Especially for less frequent users, it would help to increase the understanding of the healthcare system so that patients can make a more deliberate choice when seeking medical care.

Research on this topic is scarce and mainly originates in the USA. Here, two studies found that the introduction of copayments ranging from $20 to $100 resulted in an overall decline of ED visits of 12–23% [9,10]. As the urgency of the presenting condition declined, copayments reduced ED utilization with greater effect [9,11]. Two studies showed there was no increase in adverse clinical events after the introduction of ED copayments [10,12]. However, because of the different healthcare systems, these numbers are difficult to compare with the Dutch situation.

To the best of our knowledge, only two studies from the Netherlands have been carried out on this topic [13,14]. The different study methods probably led to different findings from ours. One study asked a consumer's panel (a random group of individuals, not visiting an ED) at what copayment amount they would not visit the ED [13]. Our study handed out questionnaires to SRPs in the ED and asked at what copayment level they

would choose to primarily visit the GP when confronted with similar symptoms. This is a better population to ask with this question and makes it less hypothetical to answer. The other Dutch study asked SRPs in the ED what they were willing to pay for their ED visit; 30% answered that they were not willing to pay anything [14]. The phrasing of this question does not lead to a sensible answer when seeking to examine the effects of an introduction of copayments for self-referred visits, but merely studies the motivation of patients to pay a copayment.

Limitations

This is a questionnaire study, where patients were asked about a hypothetical situation. However, this is the only way to study this subject in the Netherlands because currently there are no copayments allowed for visiting the ED.

With 22.4%, the response rate was relatively low. Not all SRPs were offered questionnaires, partly because of high work pressure in the ED and language barriers. In addition, the patients who were included in this study were generally in a lower triage category compared with the reference population. This was expected as patients in higher triage categories can be too ill to fill out a questionnaire.

When carrying out the ordinal regression analysis, 36% of patients were not included in the analysis because of missing values. This makes the analysis less reliable.

CONCLUSION

With a copayment of €100, 47% of the SRPs would choose to visit their GP instead of the ED. We found no specific copayment level that resulted in reducing mainly inappropriate ED visits.

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CHAPTER 7

Impact of a well-developed primary care system on the length of stay in Emergency Departments in the Netherlands: a multicenter study

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BMC Health Serv Res. 2016 Apr 26;16:149

ABSTRACT

Background

The Netherlands has a well-developed primary care system, which increasingly collaborates with hospital Emergency Departments (EDs). In this setting, insight into crowding in EDs is limited. This study explored links between patients' ED Length of Stay (LOS) and their care pathways.

Methods

Observational multicenter study of 7000 ED patient records from 1 February 2013. Seven EDs spread over the Netherlands, representing overall Dutch EDs, were included. This included three EDs with and four EDs without an integrated primary-care-physician (PCP) cooperative, forming one Emergency Care Access Point (ECAP). The main outcome was LOS of patients comparing different care pathways (origin and destination of ED attenders).

Results

The median LOS of ED attenders was 130.0 min (IQR 79.0–140.0), which increased with patients' age. Random coefficient regression analysis showed that LOS for patients referred by medical professionals was 32.9 min longer compared to self-referred patients (95 % CI 27.7–38.2 min). LOS for patients admitted to hospital was 41.2 min longer compared to patients followed-up at the outpatient clinic (95 % CI 35.3–46.6 min), 49.9 min longer compared to patients followed-up at the PCP (95 % CI 41.5–58.3 min) and 44.6 min longer compared to patients who did not receive follow-up (95 % CI 38.3–51.0 min). There was no difference in LOS between hospitals with or without an ECAP.

Conclusions

With 130 min, the median LOS in Dutch EDs is relatively short, comparing to other Western countries, which ranges from 176 to 480 min. Although integration of EDs with out-of-hours primary care was not related to LOS, the strong primary care system probably contributed to the overall short LOS of ED patients in the Netherlands.

BACKGROUND

Crowding of Emergency Departments (EDs) is a growing concern in many countries, leading to increasing lengths of stay (LOS) in the ED. Long LOS has been associated with decreased patient satisfaction, treatment delays, patients leaving without being seen and ambulance diversions. Non-urgent visits, influenza season and hospital bed shortages are some of the factors that have been identified as causes for crowding, [1–5]. Because non-urgent ED visits are also associated with ED crowding and policies to redirect these patients to primary care might contribute to a reduction of LOS [6, 7]. The success of redirecting patients is influenced by the structure of the national healthcare system and the position of primary healthcare. Worldwide, different models of organized healthcare systems are used to redirect patients to primary care services, each having its unique effect on the ED patient population [8–11].

In the Netherlands, primary healthcare is well-developed and accessible for patients 24 h a day. During office-hours patients can present at their own primary care physician (PCP) practice, usually on the same day. After-hours, primary care practitioners provide emergency services through large scale PCP Cooperatives [12]. There is an increasing trend towards implementing Emergency Care Access Points (ECAP); a place where EDs and PCPs work together, creating one desk where triage decides if the patient will be seen by a PCP or in the ED [13]. The main goal is redirecting the non-urgent self-referrals to the PCP and having the PCP function as a gatekeeper for emergency department visits. The implementation of the ECAP has led to a decrease of self-referred ED patients and changed the acuity and admission rates of presenting ED patients [14–18]. Despite growing concerns of increasing LOS in the Netherlands, there was a shortage of data on LOS at EDs and associated factors. In particular, there was no research available that looked at patients' care pathways, that is origin and destination of patients attending the ED.

This study aimed to provide insight in the LOS in EDs and to explore links with patients' care pathways in the Netherlands, a country with a well-developed primary health care system.

METHODS

Study design and setting

This was an observational multicenter study of 7000 patient records of EDs in the Netherlands. To make sure our data represented Dutch EDs, patients were sampled from seven EDs spread over the Netherlands, including small urban EDs, large inner city EDs and EDs with and without an ECAP. The patient samples comprised the first 1000 attending patients from February 1st 2013 onwards. Patients, who were registered in the ED system, but received healthcare at the PCP cooperative, an out-patient clinic or directly went to the obstetric ward or the cardiac emergency department, were excluded. The average time to include 1000 patients per hospital was 12.8 days (9–17 days). Since there are seasonal effects on LOS, we choose to collect data in the winter months, where LOS overall is longest. This was to compare how the Dutch LOS would compare to international LOS, i.e. the United States, Canada and the United Kingdom.

Methods and measurements

All hospital EDs had digital registration systems, and the extracted data were put anonymously and numbered in a database. A standardized format was provided to each hospital to ensure that the provided data was comparable. The participating hospitals provided descriptive information regarding the use of a triage system, total annual ED admission over 2012 and the presence of an ECAP. Furthermore, descriptive data were collected, regarding the number of hospital beds, total annual hospital admissions, mean length of hospital stay and the adherence area when available.

Besides LOS, the measures included: date and time of arrival and departure, sex, age, acuity (triage category), trauma or non-trauma related, origin (self-referred, referred by PCP, ambulance, via the radiology department, other) and destination (admitted to hospital, out-patient clinical follow-up, PCP follow-up, no follow-up and other).

Patients who were referred by a PCP and arrived by ambulance comprised a separate category registered in the digital systems. Depending on individual hospital systems, they could either be in the PCP group or in the ambulance group. We therefore combined the two groups and classified these patients as referred by medical professionals. During office-hours PCPs in the Netherlands have the option to refer patients directly to the radiology department for a diagnostic work-up (x-ray or ultrasound). Some ECAPs also have this option after-hours. A radiologist reads the obtained images and either refers

the patient to the ED when abnormalities are found or back to the PCP. Because a shorter ED LOS was expected for this group, patients that attended the ED via the radiology department were separately categorized.

Outcomes

The primary outcome was overall patients' LOS at the ED. Secondary outcomes were LOS for different patients origin (self-referred patients, patients referred by medical professionals and patients referred by the radiology department) and patients follow-up (Admission, follow-up at the out patient clinic, follow-up with the PCP or no follow-up).

Analysis

All data were checked for integrity and entered in a database. When data about the LOS was missing or appeared to be outliers, the contact person of the specific hospital was contacted and the missing data was handsearched, corrected if needed and added to the database. For data analysis we used IBM SPSS Statistics Version 19. Descriptive statistics (totals, medians, 95 % CI, interquartile range) were used to describe LOS, patient characteristics, and care pathways. We explored whether patient's LOS was related to origin, destination, time of presentation and the presence of an ECAP. Because the ECAPs only operate after-hours we analyzed LOS comparing ECAP and non-ECAP hospitals only in the after-hours period.

Random coefficient regression modeling was used to explore links of LOS with patients' age, sex and whether or not patients presented with a trauma related problem. These patient-related measures were included as fixed effects. In a separate regression model we explored the links of LOS with time of presentation, origin, follow up and the presence of an ECAP both separately and combined with age, sex and a trauma related problem (all as fixed factors). Hospital was included as a random factor for all analysis except for the ECAP analysis. P-value < 0.05 was considered significant.

RESULTS

Hospital characteristics

Table 1 provides descriptive information on the seven participating hospitals. These were spread over the country, varied in size, and included the two largest EDs of the Netherlands.

Table 1 - Hospital and ED characteristics

		Overview Hospitals							
		Hospital 1	Hospital 2	Hospital 3	Hospital 4	Hospital 5	Hospital 6	Hospital 7	Total
	Urbanization	Urban	Urban	Inner-city	Urban	Urban	Inner-city	Urban	--
	Geographic region	Middle	South-west	North-West	Middle	South	West	South East	--
	Population served	460,000	500,000	n/a	n/a	250.000	n/a	280.000	--
	Hospital beds*	955#	545	555	663	696	654	479	479-955#
	Total admissions*	26,784	26,957	26,022	31,563	28,988	38,861	23.553	202.728
	ED admissions of total hospital admissions (%)*	46.2	35.9	30.1	28.6	38.0	32.0	38.0	35.2
	Mean length hospital stay (days)*	5.4	5.1^	5.0	4.5^	4.8	4.3	4.9	4.3-5.4
ED	Total patients per year*	36.721	28.234	48.978	24.365	32.132	43.362	26.661	240.453
	Total of ED admissions*	12.383	9.678	7.822	9.030	11.027	12.449	8.961	71.350
	ED admissions of total ED presentations(%)*	33.7	34.3	16.0	37.1	34.3	28.7	33.6	29.7
	EP present 24/7	Yes	Yes	No	Yes	No	No	No	-
	ECAP	No	No	No	Yes	Yes	Yes	No	-
	Triage System	MTS	ESI	ESI	MTS	NTS	MTS+	MTS	-

^ N/A in year report, calculated (Known admissions and length of hospital stay), * table presenting numbers of the year 2012. # also includes daycare beds. MTS stands for Manchester triage system, ESI for Emergency Severity Index and NTS for Netherlands Triage Standard

Three hospitals were tertiary cardiac referral centers that performed primary cardiac interventions (PCI). One hospital was a level one-trauma center and three hospitals had 24/7 emergency physicians staffed. Together the hospitals treated 240.453 patients in their EDs in 2012, of which 71.350 patients were admitted to the hospital. This equals an admission rate of 29.7 % of all ED attendances and makes up 35.2 % of total hospital admissions. The average length of hospital admissions ranged from 4.3 to 5.4 days.
Three different triage systems were in use: the Manchester Triage System (MTS), Emergency Severity Index (ESI) and the Netherlands Triage Standard (NTS). There were three hospitals with an ECAP and four without an ECAP.

Patient characteristics

Of the 7000 included patients, 51.9 % was male and the mean age was 47.0 years (median 49.0, SD 25.6). The majority of patients presented during weekdays (41.9 %) compared to evenings (30.0 %), nights (13.1 %) and weekend days (15.0 %). Of all ED attendances, 32.0 % presented with a trauma related problem. Overall, 36.3 % of ED attendances were admitted to the hospital, 28.5 % were followed up in an outpatient clinic, 9.3 % were referred to their PCP for follow-up and 20.7 % did not require any follow-up (Table 2).

Length of stay

The median LOS was 130.0 min (interquartile range across EDs: 79.0–194.0). Figure 1 shows that there was a peak in LOS at the end of the night and a slightly smaller peak at the end of the afternoon. The majority of patients presented in the afternoon between 12 PM and 5 PM. The median LOS was longest for patients presenting with a non-trauma related problem (151 min), patients presenting during week-days (142 min), patients referred by medical professionals (148 min) and patients who were admitted to hospital (169 min). For patients referred by the radiology department the median LOS was shortest with 71.5 min (Table 3).

Table 2 - Patient characteristics and care pathways (n=7000)

		Mean of all hospitals	Lowest-highest value per hospital
Male (%)		51.9	48.4 – 56.2
Age (%)	0-5 years	7.0	1.7 – 9.5
	6-18 years	9.3	5.6 – 10.5
	19-30 years	14.8	11.1 – 20.6
	31-50 years	20.8	17.0 – 26.0
	51 – 65 years	19.9	18.0 – 22.1
	66 – 85 years	23.1	12.0 – 26.8
	> 85 years	5.1	3.0 – 8.4
Presentation (%)	Weekdays #	41.9	37.3 – 50.4
	Evenings $	30.0	28.5 – 31.9
	Nights ^	13.1	12.2 – 15.0
	Weekend days#	15.0	7.1 – 19.6
Origin (%)* N=6908 §	Self-referred patients	21.2	9.4 – 51.2
	Referred by medical professionals +	59.9	38.3 – 77.2
	Referred by the radiology department	3.3	3 – 4.8
Follow-up (%)*	Hospital Admission	36.3	18.5 – 43.5
	Out patient Clinic	28.5	15.7 – 36.4
	Primary Care Physician	9.3	1.9 – 39.5
	None	20.7	9.0 – 26.1
Trauma (%)		32.0	25.4 – 36.0

Does not add up to 100% due to other options not shown in the table # 8am-5pm, $ 5pm-12am, ^12am-8am, § there were 92 missing data on patients origin. +Includes ambulance and PCP referred patients

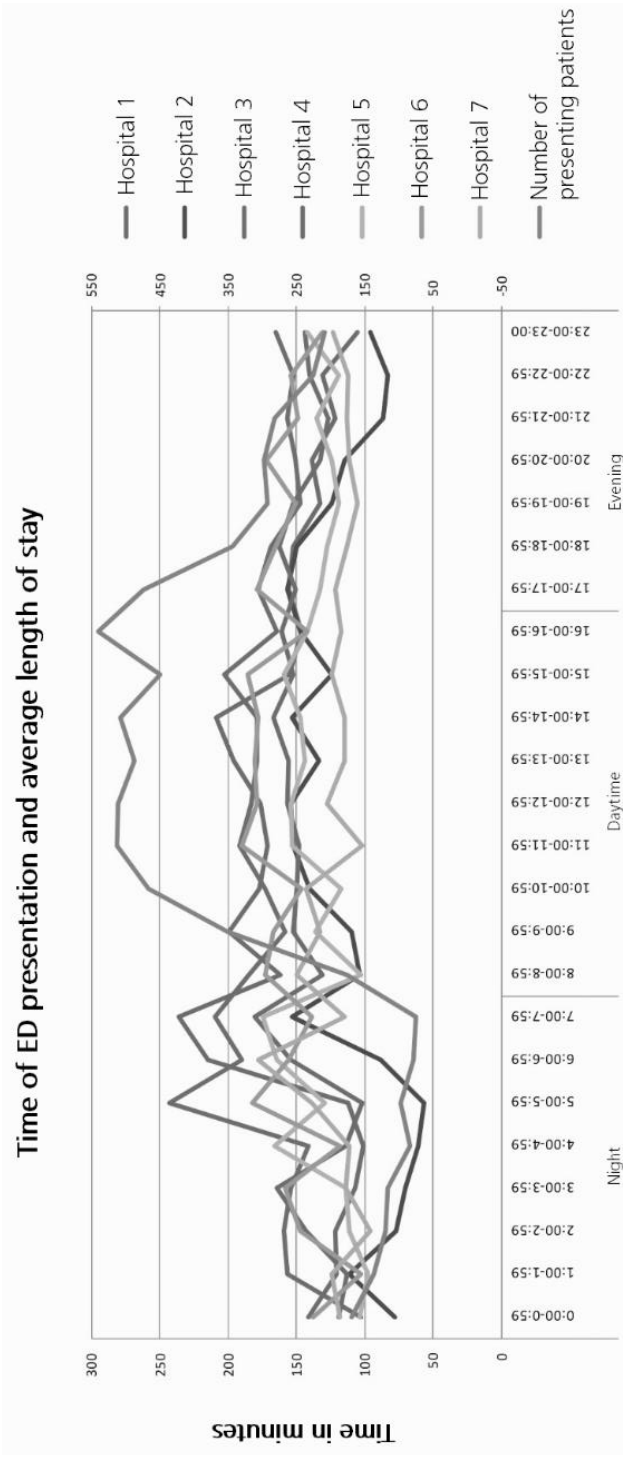

Figure 1 - Mean length of stay of all ED patients combined in one 24-hour period

Table 3 - Length of stay (LOS) stratified by patient characteristics and care pathways

	N=7000	Median LOS (in minutes)	Interquartile range
Overall median LOS		130.0	79.0 – 194.0
Gender	Male	134.5	84.0 - 198.0
	Female	127.0	74.0 - 191.0
Trauma*	Yes	91.0	52.0 - 141.0
	No	151.0	99.0 - 215.0
ECAP	Yes	136.0	82.0 - 200.0
	No	125.5	76.0 - 190.0
Time of presentation*	Weekdays ^	142.0	86.0 – 210.0
	Evenings	123.0	77.0 – 176.0
	Nights	116.0	69.5 – 172.0
	Weekend days	126.0	72.0 – 199.0
Origin* N=6908 §	Self-referred patients^	99.0	54.0 - 154.0
	Referred by medical professionals +	148.0	97.0 - 212.0
	Referred by the radiology department	71.5	44.0 - 125.0
Follow-up *	Hospital Admission^	169.0	120.0 - 238.0
	Out patient Clinic	108.0	66.0 - 164.0
	Primary Care Physician	122.0	79.0 - 179.5
	None	93.0	53.3 - 145.0

* $P < 0.05$ in the regression analysis, ^ compared parameter in the random coefficient regression analysis
§There were 92 missing data on patients origin.

The random coefficient regression analysis showed that patients presenting with a trauma related problem had a 51 min shorter LOS (95 % CI, 46.6–55.6 min) compared to patients with a non-trauma related problem.

LOS increased with age (p 0.00). There was no association with LOS and sex. Compared to presentations during weekdays, LOS was significantly shorter for presentations in the evening (21.1 min, 95 % CI 15.8–26.4), night (25,2 min, 95 % CI 18.1–32,2) and on weekend days (15.8 min, 95 % CI 9.1–22.5) Compared to self-referred patients, LOS was significantly shorter for patients referred via the radiology department (14.9 min, 95 % CI 2.2–22.5) and significantly longer for patients referred by medical professionals (57.3 min, 95 % CI 52.0–62.5). Compared to patients requiring a hospital admission, there was a significantly shorter LOS for patients followed-up in an out-patient clinic

(63.8 min, 95 % CI 58.6–69.1), followed-up by their PCP (72.2 min, 95 % CI 63.7–80.7) or who did not need any follow-up (71.3 min, 95 % CI 65.2–77.7).
Regarding the moment of presentation, the LOS was longest on weekdays. After correcting for age, sex and trauma, the mean LOS was 13.1 min shorter in the evening (95 % CI, 8.2–18.1 min, P 0.00), 20.4 min shorter at night (95 % CI, 13.9–27.0 min, P 0.00) and 11.0 min shorter on weekend days (95 % CI, 4.7–17.2 min, P 0.001). Compared to self-referred patients, only the LOS for patients referred by medical professionals remained significantly longer, with 32,9 min (95 % CI 27.7–38.2 min, P 0.00). For follow-up, LOS was longest for patients requiring a hospital admission. LOS remained significantly shorter with 41.2 min for patients followed up at outpatient clinics (95 % CI 35.4–46.2 min, P 0.000), 49.9 min shorter for patients followed up with their PCP (95 % CI 40.3–57.1 min, P0.000) and 44.6 min shorter for patients who did not need any follow-up (95 % CI 43.2–55.1 min, P0.000) (Table 4). There was no significant difference in LOS between ECAP and non-ECAP hospitals after-hours.

Characteristics of factors associated with different LOS

Of 6908 patients (92 had missing data), 21.2 % was self-referred (median LOS 99.0 min), 59.9 % was referred by medical professionals (median LOS 148.0 min) and 3.3 % presented via the radiology department (median LOS 71.5 min). The mean age for self-referrals was 37.5 years and for patients referred by medical professionals 50.9 years old. Of the self-referrals, 51.6 % presented with trauma related symptoms and the majority (56.1 %) was aged between 16 and 50 years old. A total of 11.4 % of the self-referrals required hospital admission. Patients referred by medical professionals presented with mostly non-trauma related symptoms (73.1 %) and the majority was aged between 51 and 85 years old. With 48,9 %, a much higher percentage of these patients required admission. Only 3.5 % of patients referred by the radiology department required a hospital admission and 75.6 % was followed up at the outpatient clinic (Table 5).

Table 4 - Factors associated with LOS

		Before including fixed effects#				After including fixed effects#			
		Difference in LOS*	95% Confidence Interval		P-Value	Difference in LOS*	95% Confidence interval		P-Value
			Lower bound	Upper bound			Lower bound	Upper bound	
Time of presentation	Weekday*	Reference				Reference			
	Evening	-21.1	-26.4	-15.8	0.000	-13.1	18.1	-8.2	0.000
	Night	-25.2	-32.2	-18.1	0.000	-20.4	-27.0	-13.9	0.000
	Weekend day	-15.8	-22.5	-9.1	0.000	-11.0	-17.2	-4.7	0.001
Origin	Self referred*	Reference				Reference			
	Referred by medical professionals	57.3	52.0	62.5	0.000	32.9	27.7	38.2	0.000
	Referred via radiology	-14.9	-27.6	-2.2	0.022	-6.5	-18.7	5.6	0.293
Follow up	Hospital Admission*	Reference				Reference			
	Out patient Clinic	-63.8	-69.1	-58.6	0.000	-41.2	-46.6	-35.8	0.000
	PCP Follow-up	-72.2	-80.7	-63.7	0.000	-49.9	-58.3	-41.5	0.000
	No Follow-up	-71.3	-77.7	-65.2	0.000	-44.6	-51.0	-38.3	0.000

Legend. ^ Results from random coefficient regression modeling, all analysis included hospitals as random effect, # fixed effects are age, sex and trauma, * difference in LOS compared to the reference category

Table 5 - Characteristics of patient groups

		Self-referrals (N=1877)	Referrals	
			Medical Professionals (N=4138)	Radiology Department (N=230)
Total (%)		21.2	59.9	3.3
Male (%)		57.5	49.6	50.0
Age (%)	0-5 years	6.2	8.0	2.2
	6-15	8.6	4.6	18.3
	16-30	29.6	13.2	16.1
	31-50	26.5	18.5	19.6
	51 – 65	16.6	20.5	23.5
	66 – 85	10.8	28.4	15.2
	> 85	1.7	6.8	5.2
Presentation (%)	Weekday#	38.0	40.9	92.6
	Evening$	31.5	30.9	4.8
	Night^	14.2	14.1	1.3
	Weekend day#	16.2	14.1	1.3
Follow-up (%)*	Hospital Admission	11.4	48.9	3.5
	Out patient Clinic	29.4	24.4	75.6
	PCP Follow-up	18.6	6.2	3.0
	No Follow-up	31.6	17.5	12.2
Trauma (%)		51.6	23.4	89.6
Median LOS (minutes)		99.0	148.0	71.5

	N = 4070[&]	ECAP (N=1785)	Non-ECAP (N= 2285)
Male (%)		51.9	53.1
Age (%)	0-5 years	6.8	8.9
	6-15 years	4.4	7.6
	16-30 years	19.4	22.3
	31-50 years	21.2	21.8
	51 – 65 years	19.3	17.5
	66 – 85 years	23.7	17.9
	> 85 years	5.3	4.0
Time of presentation	Evenings [$]	49.9	53.0
	Nights ^	23.1	22.1
	Weekend days[#]	27.0	24.9
Origin (%)*	Self-referred patients	15.6	38.7
	Referred by medical professionals [+]	74.1	49.1
	Referred by the radiology department	0.5	0.4

		Self-referrals (N=1877)	Referrals	
			Medical Professionals (N=4138)	Radiology Department (N=230)
Follow-up (%)*	Hospital Admission	42.7	31.7	
	Out patient Clinic	27.7	26.7	
	Primary Care Physician	5.0	13.3	
	None	21.0	23.2	
Median LOS (Minutes)		129.0	118.0	
Trauma (%)		28.8	35.8	

*Does not add up to 100% due to other options not shown in the table [#] 8am-5pm, [$]5pm-12am, ^12am-8am, [§]there were 92 missing data on patients origin. [+] Includes ambulance and PCP referred patients [&] N during opening hours ECAP

During ECAP opening hours, the median LOS in ECAP EDs was 129 min compared to 118 min in non-ECAP EDs. In ECAP EDs the average age was 47.6 years old with the majority between 66 and 85 years. In non-ECAP EDs the average age was 42.1 years old with the majority aged between 16 and 30 years old. In ECAP EDs, 15.6 % were still registered as self-referred patients compared to 38.7 % in non-ECAP EDs. These patients presented to the ECAP unannounced and were registered for the ED after triage. For patients referred by medical professionals this was 74.1 % compared to 49.1 %. In ECAP hospitals 42.7 % of patients required an admission compared to 31.7 % in non-ECAP hospitals (Table 5).

Limitations

Though the data was extracted from digital hospital systems, they included self-reported data, which could have caused inaccuracies. Furthermore this study did not involve academic centers. The data does however represent the overall Dutch healthcare system with EDs from seven different regions. When combining patients referred by PCPs and patients arriving by ambulance in the same group, there is a small percentage of self-referrals in that group. Ambulances, however, have the option not to transport the patient to the ED and instead have patients use their own mode of transport or contact the patients PCP and hand over treatment. This makes the percentage of low-acuity patients in the combinedMgroup small and therefore it seems plausible to combine them. Since there were three different triage systems in use, we could unfortunately not compare patients triage in association with LOS. The same applies to differences in trauma scores. To the best of our knowledge this is the first research in Dutch EDs exploring the influence of a strong primary care system on LOS.

DISCUSSION

This study assessed the relationship between length of stay and patients' care pathways in hospital EDs in the Netherlands. It showed an overall median LOS of 130 min. Factors associated with a longer LOS were older age, presentation during weekdays, referral by medical professionals and hospital admission. A factor associated with a shorter LOS was linked to patients who underwent ancillary tests prior to ED presentation. A median LOS of 130 min is relatively short compared to internationally published estimates of LOS, which had median values from 176 to 480 min [19–21]. Our data showed a shorter median LOS for both admitted patients and discharged patients compared to the United States for similar sized EDs, hospitals with the same number of in-hospital beds and EDs with more than 20 % trauma related problems [22, 23]. Factors related to a longer LOS probably represent similar patients, for instance patients being admitted to the hospital are often older and referred by a medical professional. This group may benefit from organizational improvements at the ED such as fast tracks [24, 25]. To guarantee patient safety in such fast tracks more insight into risk factors is needed, which indicate a need for more extensive diagnostic procedures (i.e. abdominal pain in an elderly patient).

Our study showed a significant shorter LOS for patients referred via the radiology department compared to other origin. In the Netherlands, it is a common procedure during office hours and at several ECAPs to refer the patient directly to the radiology department for ancillary testing. If an abnormality is found, the patient will then be referred to the ED. When no abnormalities are found, the patient will not present at the ED but will be referred back to the PCP [14]. Implementing this possibility for all PCPs and ECAPs could further reduce the overall median LOS for ED attendances that require an ED visit since tests have already been performed. Furthermore, it will decrease the number of unnecessary referred patients, should a test be negative. If PCPs also have the possibility to perform diagnostic laboratory tests after-hours as they do during office hours, this would even further reduce the number of referred patients.

This study showed an overall admission rate of 36.3 % of all ED attendances, which is higher in percentage compared to the United States (US) and the United Kingdom (UK) [26, 27]. With only 11.4 % of the already small group of self-referrals (21.2 %) being admitted compared to 48.9 % of patients being referred by their PCP, it suggests that PCPs function well as gatekeepers to the ED.

There are several factors identified as causes for crowding and all of them could explain the relatively short LOS in Dutch EDs. One of the factors is the non-urgent ED patient. In the Netherlands approximately 1.9–2.2 million patients visit the ED yearly, around 124–135 visits per 1000 inhabitants [28]. This is low compared to other countries like the United States, 405–428 per 1000 inhabitants, Canada, 470 per 1000 inhabitants and the UK where 396 per 1000 inhabitants visit the ED yearly [29–32]. Good access to quality primary care seems the key reason for the large difference in ED visits.

In the Netherlands, primary healthcare is well-developed and accessible for patients 24 h a day. During office-hours patients can see their own PCP, usually on the same day. After-hours, PCPs provide emergency services through large scale PCP-cooperatives [12]. In the United States, where the median LOS is longer compared to the Netherlands, access to primary care is not readily available for everyone. In fact, the percentage of PCPs providing after-hours care is only 29 % compared to almost a 100% in the Netherlands [10]. As a result, United States EDs may increasingly serve as a safety net with increasing numbers of patient visits. The average yearly number of 26.666 ED patient visits in the United States (total annual yearly ED visits divided by total number of national EDs) is high compared to the Netherlands, where an average of 22.448 patients visit each ED per year. These differences in healthcare systems make comparison of LOS difficult. It does however show that primary care, resulting in a low percentage of self-referrals, leads to a shorter LOS.

Another factor associated with crowding is the number of hospital beds. The Netherlands has 4.7 beds per 1000 inhabitants compared to 3.0 per 1000 inhabitants in the United States and the United Kingdom and 3.2 beds per 1000 inhabitants in Canada [33]. It seems that the overall healthcare system in the Netherlands plays a large role in the shorter LOS.

We did not find a significant difference in LOS after-hours between hospitals with and without an ECAP. Hospitals with an ECAP see more referred patients and more patients requiring an admission, both factors associated with a longer LOS [14]. When analyzing 1000 consecutive patients in non-ECAP EDs with a higher percentage of self-referrals, and comparing them with 1000 consecutive patients in ECAP EDs, which are mostly, referred patients, a similar LOS might assume that it is not the illness severity of the patient that is predictive for the LOS, but rather the ED procedure. The intention was also to compare LOS of patients with a different acuity, but due to three different triage systems this was not possible. Because diagnostic tests are ordered for 65 % of the non-urgent patients and 95 % of the urgent patients in Dutch EDs, It seems plausible that

there is no difference in performed diagnostic tests between the self-referral and the referred patient [34]. Although crowding is mentioned as a problem by ED managers in a web-based survey, factors associated with LOS in EDs in the Netherlands were never studied.

CONCLUSION

This study showed that LOS in EDs in the Netherlands is relatively short compared to other countries, which is probably due to its well-developed primary care system. LOS was longer for older patients, patients referred by medical professionals and patients who required a hospital admission. With the number of ECAPs increasing, LOS can perhaps decrease, by strengthening primary healthcare even more, through implementing PCP access to ancillary services like radiology and laboratory tests and by collaboration guidelines between PCP and ED care. Gaining insight in presenting complaints and performed diagnostic tests seems crucial to develop these guidelines and implement fast tracks to reduce LOS.

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CHAPTER 8

Development and validation of an admission prediction tool for Emergency Departments in the Netherlands

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Emerg Med J. 2018 Apr 7. pii: emermed-2017-206673

ABSTRACT

Objective

Early prediction of admission has the potential to reduce length of stay in the ED. The aim of this study is to create a computerised tool to predict admission probability.

Methods

The prediction rule was derived from data on all patients who visited the ED of the Rijnstate Hospital over two random weeks. Performing a multivariate logistic regression analysis factors associated with hospitalisation were explored. Using these data, a model was developed to predict admission probability. Prospective validation was performed at Rijnstate Hospital and in two regional hospitals with different baseline admission rates. The model was converted into a computerised tool that reported the admission probability for any patient at the time of triage.

Results

Data from 1261 visits were included in the derivation of the rule. Four contributing factors for admission that could be determined at triage were identified: age, triage category, arrival mode, and main symptom. Prospective validation showed that this model reliably predicts hospital admission in two community hospitals (area under the curve (AUC) 0.87, 95% CI: 0.85 to 0.89) and in an academic hospital (AUC 0.76, 95% CI: 0.72 to 0.80). In the community hospitals, using a cut-off of 80% for admission probability resulted in the highest number of true positives (actual admissions) with the greatest specificity (positive predictive value (PPV): 89.6, 95% CI: 84.5 to 93.6;. negative predictive value (NPV): 70.3, 95% CI: 67.6 to 72.9). For the academic hospital, with a higher admission rate, a 90% probability was a better cut-off (PPV: 83.0, 95% CI: 73.8 to 90.0, NPV: 59.3, 95% CI: 54.2 to 64.2).

Conclusion

Admission probability for ED patients can be calculated using a prediction tool. Further research must show whether using this tool can improve patient flow in the ED.

INTRODUCTION

Increasing length of stay in Emergency Departments (EDs) diminishes quality of care and is associated with decreased patient satisfaction, increased morbidity among ventilated patients, and increased mortality among critically ill patients.[1] The decision whether to admit a patient is often postponed until all results of laboratory testing, radiological studies, and consultations from different specialists are available. It might therefore be helpful to know upfront what the probability of hospitalisation is for an individual ED patient. This may help the treating emergency physician to anticipate a hospital admission, thereby reducing the length of stay in the ED.

Multiple studies have looked at factors that predict hospital admission, and many decision models have been developed. However, most of these previous studies concentrated on specific diseases or a subgroup of patients.[2–15] A few earlier studies focused on predicting hospital admission for the entire ED population, but these used only limited patient data.[16–19]

With this study, we aimed to develop one, broadly applicable, prediction tool that could be applied on the entire, undifferentiated ED population at multiple sites. We wanted to create a prediction tool that is easy to use, right from the start of the ED consultation.

METHODS

The derivation of the prediction tool was performed in the ED of Rijnstate Hospital, a 955-bed community teaching hospital in the Netherlands, which covers an area with 460 000 inhabitants. In 2011, there were 41 806 ED visits, of which 12 050 patients (28.8%) were admitted. The hospital has a separate department for emergency cardiology, which means referred cardiology patients are not seen at the ED. Triage is performed using the Manchester Triage System (MTS). [20] After approval from the local ethics committee, all patients who visited the ED between 10 and 16 January and between 9 and 15 May 2011 were included. Two separate periods were chosen to account for seasonal variation. Based on expert opinion and review of the literature, the following factors that might influence hospital admission were identified and collected from all included patients: sex, age, type of main symptom, MTS category, arrival mode (own initiative, referral by general practitioner, ambulance and otherwise), medical history (categorised

by organ system), laboratory tests performed, radiological imaging performed and day of the week. These data were prospectively collected. We included as admissions patients who died in the ED and those who were transferred to another hospital due to bed shortages or need for specialist care.

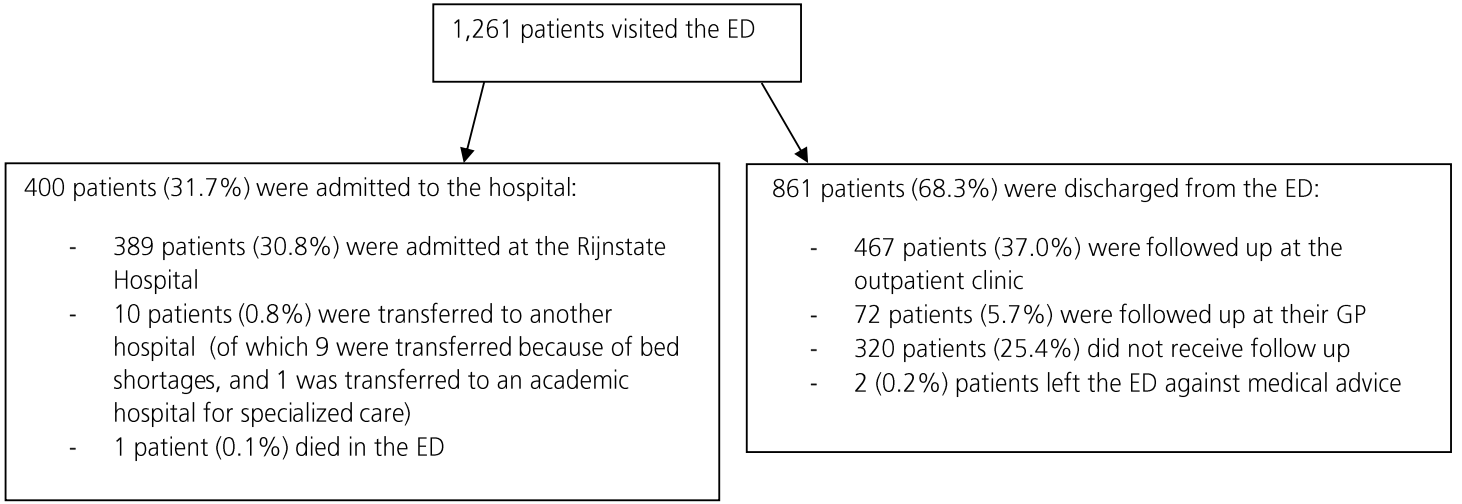
Descriptive statistics were used to describe the patient population. The Fisher Eexact test was used to explore the relation between factors associated with hospitalisation. Next, a multivariate logistic regression analysis was performed on all factors to identify independent factors. From this analysis, the most contributing (with the highest ORs) and readily available factors were selected. Subsequently, to build the prediction model, the multivariate logistic regression analysis was performed again, including only these four factors. The predicted probability of hospitalisation for the individual patient was defined as $\frac{1}{1+e^{-(\beta 0+\beta 1X1i+\beta 2X2i+\beta 3X3i+\cdots+\beta nXni)}}$, in which β0 is the intercept and βn are the regression coefficients of the corresponding factors.

Validation of the prediction model was done at three sites. A sample size calculation calculated a total of 250 admitted patients necessary for validation of this model. One validation site was the original hospital, in which we prospectively collected a new dataset of patients visiting the ED at the Rijnstate Hospital between 5 and 13 December 2011. The model was also validated at the Canisius-Wilhelmina Hospital (CWH), a community-teaching hospital with 455 beds and 26 000 ED visits in 2015, from which 40% was admitted to the hospital, and Radboud University Medical Center (RadboudUMC), an academic hospital with 564 beds and 18 907 ED visits in 2015, from which at least 38% was admitted. Data were prospectively collected. Both hospitals have separate departments for emergency cardiology (referred cardiology-patients are not seen at the ED). Triage at the CWH is performed using the MTS, and the RadboudUMC uses the Netherlands Triage System (NTS). The NTS is a similar triage-system based on three systems, namely the MTS, the Telephone Guide of the Dutch College of General Practitioners, and the National Standard for Dispatch Centre Ambulance Care. (online supplementary appendix 1). [21]

To assess the discrimination power of the prediction model, the area under the receiver operating characteristic (ROC) curves were quantified. To evaluate the calibration of the model, a calibration plot was created (for the Rijnstate Hospital, the validation dataset was used to create the calibration plot). All data were analysed in SPSS Statistics (SPSS Inc. PASW Statistics for Windows, version V.21.0).

Finally, the prediction model was transferred to Microsoft Excel to create a simple admission prediction tool.

Figure 1 – Flow sheet of patients that presented to the ED of the Rijnstate Hospital (derivation dataset)



RESULTS

The derivation set included 1 261 ED-patients that visited the ED of Rijnstate Hospital. Four hundred of these patients (31.7%) were admitted. (Figure 1).

Almost all preconceived factors were significantly related to hospitalisation (online supplementary appendix 2). Most frequently admitted were: females, elderly (above 60 years), and patients in more urgent triage categories, arriving by ambulance (especially when the patient was first seen by a GP), on whom laboratory testing or radiological imaging was performed, and patients with certain types of symptoms and medical histories. The specific day of the week did not have a significant relation with the chance of hospitalisation; however, more patients visiting the ED on a weekday than weekend were admitted to the hospital.

Multivariate logistic regression analysis on all factors was performed (online supplementary appendix 3). We selected the four most predictive and readily available factors: age, triage category, arrival mode and main symptom. Among these, several variables resulted in quasi-complete separation, meaning a patient in that category was never or always hospitalised; these patients were given a probability of hospitalisation of either 0 or 1 and were excluded from the regression analysis. Then, the multivariate logistic regression analysis was conducted on the remaining patients, including only the four selected factors (Table 1).

Table 1 – Multivariate logistic regression analysis for hospital admission

Factor Variable		Odds Ratio	95% Confidence interval		Regression coefficients	P-value
			Lower bound	Upper bound		
Age (years)						
	0-18	Reference category				
	19-29	0.99	0.48	2.06	-0.01	0.98
	30-39	1.22	0.56	2.65	0.20	0.62
	40-49	1.04	0.50	2.15	0.04	0.93
	50-59	1.95	0.95	3.99	0.67	0.07
	60-69	2.53	1.26	5.07	0.93	0.01
	70-79	5.21	2.52	10.77	1.65	<0.001
	80-89	4.51	2.22	9.17	1.51	<0.001
	> 89	7.10	2.25	22.39	1.96	0.001

Factor Variable	Odds Ratio	95% Confidence interval		Regression coefficients	P-value
		Lower bound	Upper bound		
Manchester Triage Category					
Red	Quasi-complete separation, probability of hospitalization = 1				
Orange	5.65	2.85	11.24	1.73	<0.001
Yellow	2.64	1.63	4.27	0.97	<0.001
Green	Reference category				
Blue	Quasi-complete separation, probability of hospitalization = 0				
Arrival mode					
Self-referred	Reference category				
GP	3.07	1.91	4.94	1.12	<0.001
Ambulance	4.05	2.20	7.47	1.40	<0.001
GP + Ambulance	9.19	4.02	21.01	2.22	<0.001
Radiology	1.11	0.34	3.61	0.10	0.87
Otherwise	3.66	2.02	6.64	1.30	<0.001
Check up	Quasi-complete separation, probability of hospitalization = 0				
Main symptom					
Malaise (incl vomiting/ diarrhea)	2.68	1.00	7.17	0.96	0.05
Fever / sepsis	2.55	0.87	7.51	0.94	0.09
Dyspnoea (incl coughing etc)	2.35	0.90	6.14	0.85	0.08
Chest pain / arrhythmia	0.61	0.22	1.74	-0.49	0.36
Collapse / seizure	0.57	0.20	1.63	-0.56	0.29
Allergic reaction	0.98	0.11	8.58	-0.02	0.98
Abdominal pain	1.13	0.48	2.65	0.12	0.78
Haemoptysis / GI bleed	0.93	0.23	3.73	-0.07	0.92
Intoxication	4.52	0.76	26.78	1.51	0.10
Headache	0.37	0.08	1.70	-0.99	0.20
Neurologic deficit	0.54	0.19	1.54	-0.61	0.25
Traumatic Brain Injury	0.25	0.07	0.96	-1.39	0.04
Confusion / psychiatric	0.99	0.27	3.68	-0.01	0.99
Trauma (accident)	0.35	0.12	1.00	-1.05	0.05
Musculoskeletal symptoms (traumatic / non-traumatic)	0.24	0.11	0.56	-1.42	0.001
Wound / laceration	0.10	0.03	0.42	-2.28	0.002
Rectal symptoms	0.37	0.06	2.11	-1.00	0.26
Urinary symptoms	0.21	0.05	0.87	-1.58	0.03
Diabetes (complication)	6.71	0.60	75.05	1.90	0.12
ENT symptoms	Quasi-complete separation, probability of hospitalization = 0				
Eye symptoms	Quasi-complete separation, probability of hospitalization = 0				
Deep venous thrombosis	Quasi-complete separation, probability of hospitalization = 0				
Cast complaint	Quasi-complete separation, probability of hospitalization = 0				
Needle stick injury	Quasi-complete separation, probability of hospitalization = 0				
Otherwise	Reference category				

Validation

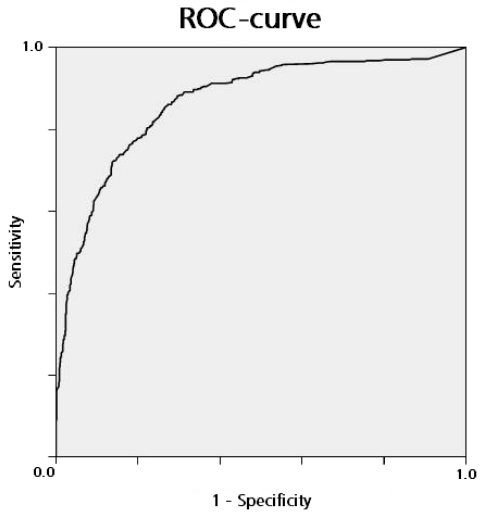
The model was applied to data from 850 patients visiting the ED of Rijnstate Hospital between 5 and 13 December 2011. This resulted in an area under the ROC curve of 0.88 (95% CI: 0.85 to 0.90). With an admission probability of 80% chosen as cut-off in the ROC curve, this would result in a possible earlier admission of 12.1% of ED patients, from which 86.7% was actually admitted. Thus, applying this model results in a possible earlier admission of 31.1% of all hospitalised patients. The calibration plot has an intercept of 0.023 (almost 0, which indicates predictions are not systematically too low or too high) and a slope of 0.974 (almost 1, which indicates there is no overfitting of the model).

For multicentre validation of the prediction model, additional data from two other EDs were collected. This resulted in two extra datasets, consisting of respectively 560 patients visiting the ED of the CWH between 1 and 8 May 2016, of which 44.7% was admitted, and 503 patients visiting the ED of the RadboudUMC between 22 and 31 March 2016, of which 49.7% was admitted. Patient characteristics are shown in online supplementary appendix 4.

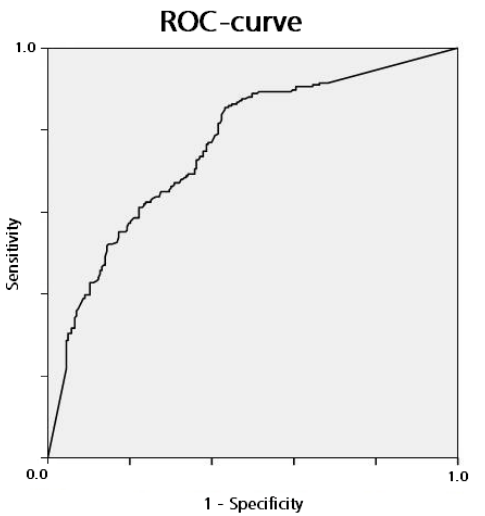
To study the effect of the prediction model in large community hospitals, the datasets from Rijnstate Hospital and CWH were combined. This resulted in an area under the ROC curve of 0.87 (95% CI: 0.85 to 0.89). (Figure 1). Chosen an admission probability of 80%, this would result in a possible earlier admission of 14.1% of ED patients, from which 89.6% was actually admitted. This results in a possible earlier admission of 33.1% of all hospitalised patients, of all non-hospitalised patients 2.4% would be wrongly admitted. (Table 2). The calibration plot has an intercept of 0.05 and a slope of 0.98. The results for the individual hospitals can be found in online supplementary appendix 5.

For the RadboudUMC (academic hospital), the application of the prediction model resulted in an area under the ROC curve of 0.76 (95% CI: 0.72 to 0.80). (Figure 2). The optimal admission probability as cut-off in the ROC curve was 90%. This would result in a possible earlier admission of 19.7% of ED patients, from which 83.0% was actually admitted. Applying the prediction model results in a possible earlier admission of 33.3% of all hospitalised patients, of all non-hospitalised patients, 6.6% would be wrongly admitted. (Table 2). The ROC curves of the multicentre validation of the prediction model are shown in Figure 2.

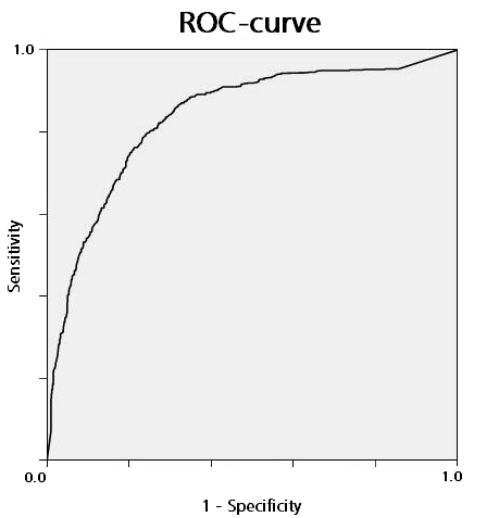
Figure 2 – ROC-curves, validation of the prediction model in two community hospitals, one academic hospital and all hospitals combined



ROC-curve community hospitals
Area under the curve 0.866
Standard error: 0.010
95% CI: 0.845 - 0.886
P < 0.001



ROC-curve academic hospital
Area under the curve: 0.760
Standard error: 0.022
95% CI: 0.717 - 0.803
P < 0.001



ROC-curve 3 hospitals combined
Area under the curve: 0.835
Standard error: 0.010
95% CI: 0.816 - 0.854
P < 0.001

Table 2 – Comparing percentages of earlier admissions and wrong admissions for different admission probabilities.

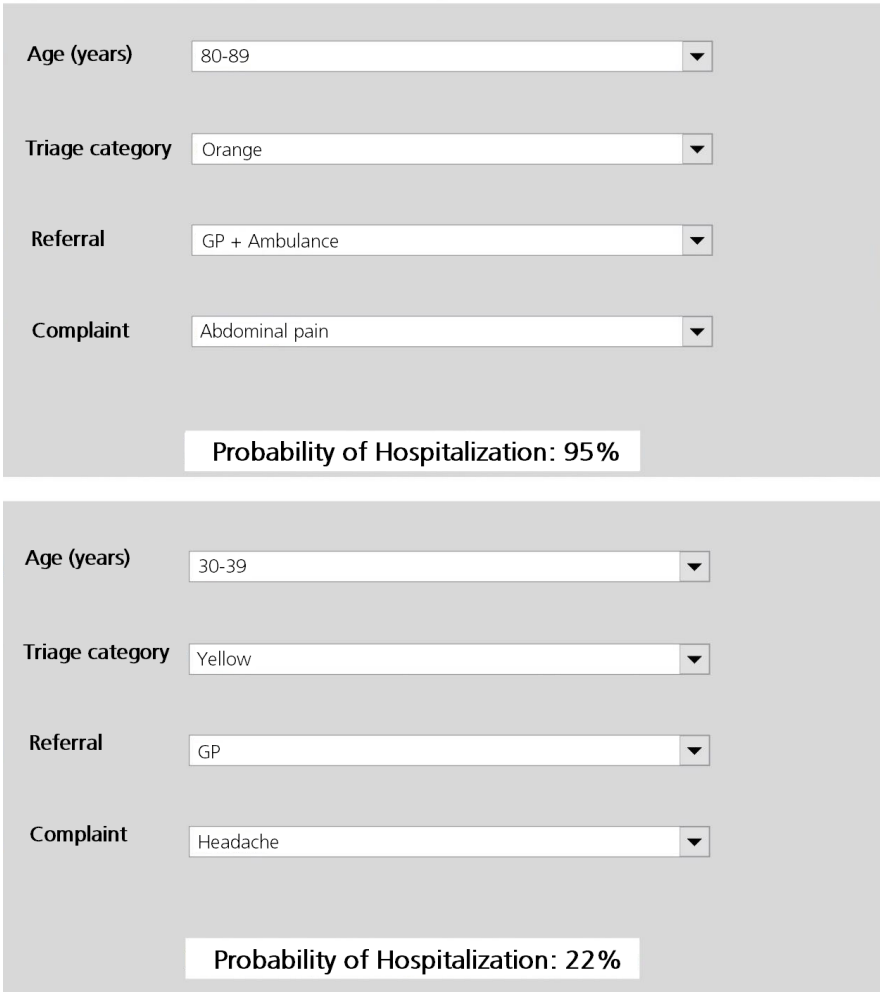
Admission probability		Community hospitals (%) (Rijnstate and CWH)	95% Confidence interval	Academic hospital (%) (Radboud UMC)	95% Confidence interval	All three hospitals combined (%)	95% Confidence interval
70%	Possible earlier admission	22.0	19.8-24.2	40.5	36.0-45.0	26.7	27.7-28.8
	PPV (actually admitted)	85.7	81.2-89.5	72.0	65.1-78.2	80.4	76.6-83.8
	NPV (actually not admitted)	75.2	72.5-77.8	66.5	60.7-72.0	73.4	71.0-75.8
	Sensitivity (earlier admitted)	49.3	45.0-53.7	59.4	52.8-65.8	52.4	48.8-56.1
	Specificity	94.9	93.2-96.3	77.8	72.0-82.8	91.1	89.3-92.7
	Wrongly admitted (100% - specificity)	5.1	3.7-6.8	22.2	17.2-28.0	8.9	7.3-10.7
80%	Possible earlier admission	**14.1**	**12.3-16.0**	31.2	27.1-35.6	**18.5**	**16.8-20.4**
	PPV (actually admitted)	**89.6**	**84.5-93.6**	77.2	69.6-83.7	**84.2**	**80.0-87.9**
	NPV (actually not admitted)	**70.3**	**67.6-72.9**	63.7	58.3-68.9	**68.9**	**66.5-71.2**
	Sensitivity (earlier admitted)	**33.1**	**29.1-37.3**	49.1	42.6-55.7	**38.0**	**34.6-41.6**
	Specificity	**97.6**	**96.4-98.6**	86.0	81.0-90.1	**95.1**	**93.6-96.2**
	Wrongly admitted (100% - specificity) specificity)	**2.4**	**1.5-3.6**	14.0	9.9-19.0	**4.9**	**3.8-6.4**
90%	Possible earlier admission	5.8	4.6-7.1	**19.7**	**16.2-23.6**	9.4	8.1-10.8
	PPV (actually admitted)	98.7	93.2-100	**83.0**	**73.8-90.0**	90.2	84.7-94.2
	NPV (actually not admitted)	65.6	62.9-68.2	**59.3**	**54.2-64.2**	64.1	61.8-66.4
	Sensitivity (earlier admitted)	14.9	12.0-18.3	**33.3**	**27.3-39.8**	20.6	17.8-23.7
	Specificity	99.9	99.3-100	**93.4**	**89.5-96.2**	98.4	97.5-99.1
	Wrongly admitted (100% - specificity)	0.1	0.003-0.7	**6.6**	**3.8-10.5**	1.6	0.9-2.5

Admission probability		Community hospitals (%) (Rijnstate and CWH)	95% Confidence interval	Academic hospital (%) (Radboud UMC)	95% Confidence interval	All three hospitals combined (%)	95% Confidence interval
100%	Possible earlier admission	0.2	0.05-0.6	13.0	10.1-16.4	3.5	2.7-4.5
	PPV (actually admitted)	100	29.2-100	82.3	70.5-90.8	83.1	71.7-91.2
	NPV (actually not admitted)	62.0	59.5-64.7	55.9	51.0-60.7	60.6	58.3-62.9
	Sensitivity (earlier admitted)	0.6	0.1-1.7	21.8	16.7-27.6	7.1	5.4-9.2
	Specificity	100	99.6-100	95.5	92.1-97.7	99.0	98.2-99.5
	Wrongly admitted (100% - specificity)	0	0-0.4	4.5	2.3-8.0	1.0	0.5-1.8

PPV = Positive predictive value: when the tool predicts that a patient will be admitted, this is correct in this percentage of cases; NPV = Negative predictive value: when the tool predicts a patient will be discharged, this is correct in this percentage of cases; Sensitivity: of all admitted patients, the tool predicts an admission in this percentage of cases; Specificity: of all patients who are discharged, the tool predicts a discharge in this percentage of cases.

The developed prediction model was then converted into a simple prediction tool in Microsoft Excel. In this program (as shown in Figure 3), variables can be selected, resulting in a probability of hospitalisation for the individual patient. Next, the tool can be incorporated in electronic records (as already done in the Rijnstate Hospital, where Chipsoft EZIS version V.5.2 is used), so the admission probability can easily be determined for the individual ED patient. The system automatically fills in the factors age, triage category and mode of arrival. Only the main symptom has to be selected from a list.

Figure 3 – Two examples of applying the prediction tool on an individual patient



DISCUSSION

This study evaluates factors predicting hospital admission for a mixed population of ED patients in the Netherlands. Four factors were selected to create a prediction model. The prediction model was validated in three hospitals and showed to be useful to predict hospital admission for the individual patient directly after triage. The model was best applicable in the two community hospitals, both using the MTS. A computerised admission prediction tool was developed, which could help emergency physicians and triage nurses anticipate a hospital admission, and possibly improve patient throughput in the ED.

This study found several factors contributing to the chance of hospitalisation. In the past, multiple studies studied factors predicting hospitalisation for patients in the ED. However, most of these studies concentrated on specific diseases, often chronic obstructive pulmonary disease [4,6,10,14], but also fractures [7,8,15], allergic reactions to food [2], syncope [5], heat illness [9], urinary tract infections [11], transient ischaemic attacks [12] and soft tissue infections in injection drug users [13]. These studies found that patients admitted to the hospital were older [4,8–12,14], more frequently arrived by ambulance [2,4] more frequently were triaged in urgent categories [4,6,10] and had more comorbidities [5,8,9,12,14]. When looking at gender, varying outcomes were found between the studies. [4,8,10–12,14] Two studies found that patients visiting the ED on a weekday were more frequently admitted. [8,11] Several studies also looked at socioeconomic status, but found varying outcomes. [9,11,12,14,15] Consistent with previous studies, this study found that higher age, arrival by ambulance, urgent triage category, presentation on a weekday, and various comorbidities are related to hospital admission.

In contrast to the above-mentioned studies, this study focused on the entire ED population. In the last years, several studies looked at the full scope of ED visits and developed models to predict hospital admission. Two studies found that age, triage category and arrival mode were predictive of the need for admission.[16 17] Kim et al [17] also found that sex, presenting symptoms, triage time of day, and whether patients were triaged over the weekend were significant predictors of hospital admission. Peck et al [18] tested different statistical methods to predict hospital admission and found that the logit-linear regression model performed best, making use of four factors: age, primary complaint, bed type designation (fast track bed or standard ED bed) and arrival

mode. Handly et al [19] added coded chief complaint data to an hospital admission prediction model (using only demographic, operational and triage acuity data) and found that this increased specificity. The results of our study are consistent with previous studies looking at the entire ED population, finding similar patients factors predicting hospital admission. Earlier studies also used logistic regression to develop prediction models. However, although previous studies included large numbers of patients, the prediction models developed in these studies were not multicentre validated, and these studies did not develop a computerised prediction tool. No previous European studies were found in which a model to predict the risk of hospitalisation was developed including the entire ED population.

Previous studies have shown mixed results of admission prediction by triage nurses.[22–25] The benefit of the introduction of an easy-to-use computerised prediction tool is that it can be used by triage nurses to reliably predict admission very early in the process of an ED visit, even before a physician had time to examine the patient, while taking away interpersonal variation between triage nurses in their ability to predict admission. One study from the USA stated it takes approximately 5 hours from triage to a request for an inpatient bed in their ED.[23] This means that the implementation of a reliable prediction tool can have a significant impact in the reduction of waiting times at the ED, by sending bed requests early on. In addition, such a prediction tool provides an indication of the incoming bed demand and can be used to inform the staff of inpatient departments. As crowding is an increasing problem in EDs worldwide, every effort should be made to optimise patient flow through the ED, to minimise unwanted consequences of crowding. Implementing our admission prediction tool could contribute to a better patient flow.

To the best of our knowledge, no admission prediction tool has been tested in practice. At this moment, the prediction tool is already incorporated into the electronic patient records of the Rijnstate Hospital. This means that every physician in this ED can easily determine the admission probability of their patient. In a future study, we want to test whether triage nurses can use this tool to predict admission for individual ED patients as they enter the ED and whether length of stay at the ED is reduced by implementing this tool.

Strengths and limitations

This study developed and validated a model to predict hospital admission for individual patients arriving at the ED, using only four patient factors. It is easy to use and can predict

admission directly after the patient enters the ED. The prediction model was validated in three hospitals, including two community hospitals and one academic hospital. To the best of our knowledge, this is the first European study in which an admission prediction tool was developed, applicable on the entire ED population.
The prediction model performed less in the academic hospital, probably partly due to the different triage system and different patient population. This study used a classification of symptoms that was not validated. Furthermore, it was performed in the Netherlands, which may limit its predictability in other countries.
In all three included hospitals, patients referred to be seen by a cardiologist are sent to a separate emergency cardiology department. Patients who self-refer with possible cardiac complaints are primarily seen at the ED. In the Netherlands, this organisation is common, and a lot of hospitals have separate emergency cardiology departments. This means, the prediction tool is not validated for patients who are referred with cardiac complaints. However, in EDs with integrated emergency cardiology departments, this tool could still be used in the rest of the ED -population.
Sometimes the specific diagnosis is necessary to admit a patient (to determine the right department for admission). This means that for a small percentage of ED patients, the prediction tool will not speed up the admission. However, for most patients, it is clear for which specialty they would be admitted early on. In addition, in the Netherlands, an increasing number of hospitals work with 'acute admission departments', where patients can be admitted for variable specialties, before all results of diagnostics are known and where the admitting specialty can easily be changed (without moving the patient to another department).

CONCLUSION

With a computerised prediction tool, the probability of hospital admission for a mixed population of ED patients can be calculated with data directly available after triage. Further research is needed to show whether the use of such an admission prediction tool can reduce length of stay in the ED and therefore reduce crowding.

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CHAPTER 9

General discussion

A significant proportion of patients treated in Dutch Emergency Departments (EDs) are self-referred. [1] With self-referral comes a risk of excessive diagnostic testing and treatment, disruption of continuity of care and higher healthcare costs, because GP-consultations are cheaper compared to ED-visits.[2,3] In addition, self-referral contributes to crowding of EDs, which is an increasing problem in EDs worldwide. During times of crowding, the demand for emergency services outweighs the accessible resources. [4] Crowding is associated with longer length of stay in EDs, delayed treatment and more morbidity and mortality. [5,6,7] Over the last years, the number of patient visits per Dutch ED has increased while the ED-population is aging and becoming more complex. [8,9] In 2012, 68% of Dutch EDs faced crowding two or more times a week. [10]
The aim of this thesis is to improve the understanding of what motivates patients to visit the ED without a referral from a GP and to study the effects of several methods that aim to reduce inappropriate self-referral and length of stay in EDs. The findings that are described in this thesis allow physicians and policy makers to make more evidence based decisions on how the acute care chain can be made more efficient. This may also contribute to a better collaboration between primary and emergency hospital care.

Main findings and interpretation

Appropriateness of ED-visits versus reasons for self-referral

When searching for methods to reduce self-referral it is essential to understand why patients self-refer to an ED. We studied the motivations of self-referred patients by performing a systematic review, a questionnaire study and a qualitative interview study (**chapters 2,3,4**). All the reported reasons for self-referral we found can be categorized in two themes: health concerns and practical reasons. In **chapter 5** we determined the appropriateness of self-referred ED-patients by three different methods. We found that the percentage of inappropriate visits ranged from 41 to 52%, indicating that about half of self-referred ED-visits are unnecessary. Ideally, interventions to reduce self-referral are directed at these inappropriate visits.

Health concerns

We found that most self-referred patients (about 60%) visit the ED because of concerns about their health, and therefore seek urgent medical care. (**chapter 2,3,4**) We correlated the appropriateness of self-referred ED-visits to the reasons for self-referral and found

that patients self-referring out of health concerns more often visit the ED appropriately. However, of the patients that self-referred because they thought their symptoms were too severe to visit a GP, 36% were still considered inappropriate and could have been treated by a GP (**chapter 3**).

Practical reasons

About 40% of self-referred patients visit out of practical reasons, which include the convenience of the ED, lesser accessibility of primary care and financial considerations. (**chapter 2,3,4**) In contrast to the GP offices, patients do not have to make an appointment when they visit the ED. The ED is always open to anyone, without restrictions. Although the proportion of patients visiting the ED out of these practical concerns is lower compared to patients visiting out of health concerns, this is the category of patients more often visiting the ED inappropriately. (**chapter 3**)

The overall results show that health concerns are a major motivation for patients to self-refer to the ED, also for patients with non-urgent symptoms. This might be an important explanation for the limited effects of previous interventions that aimed to reduce self-referral; people, who are worried about their health, will not be easily discouraged in seeking help at the ED.

Interventions that aim to reduce inappropriate self-referral

Patients that inappropriately visit the ED add to the burden of crowding and adequately directing patient flows is a vital component of controlling ED crowding and increasing cost-effectiveness of the acute care chain. Patients self-refer to EDs either out of health concerns or out of practical considerations. When developing interventions to reduce inappropriate self-referral, these distinctive motivations call for a tailored approach.

Health concerns

Health concerns are the major reason for self-referral to EDs. Because patients are often unable to adequately judge the severity of their symptoms, this can lead to inappropriate self-referral. These self-referrals may be a target for interventions that aim to reduce inappropriate self-referral, although the effectiveness may be limited: patients, who are anxious, may not easily change their mind about visiting the ED. Reasonable interventions directed at inappropriate self-referral because of health concerns include education on the symptoms for which patients have to visit an ED and when to visit a GP. However,

previous research has shown that interventions aimed at educating patients were largely ineffective in reducing inappropriate self-referral. In this study that was performed in the United States, people received a booklet with general information on when to visit an ED, but this did not show a significant effect on the number of ED-visits [11]. Education directed at specific conditions (e.g. ear pain in children, diabetes, asthma) and more intensive programs for geriatric or older, chronically ill patients have shown mixed results [12-17]. Another option is the implementation of telephone help lines for patients to get advice about their symptoms and where to seek help. In theory, this would redirect patients to the correct medical service and reduce the number of ED self-referrals. However, in the UK, NHS Direct (a national nurse-led telephone advice service) and the newer NHS 111 (better integrated with other health services) have failed to reduce the number of ED-visits.[18,19]

In addition, with interventions aimed at reducing inappropriate self-referrals, there is risk of also deterring appropriate self-referrals. After all, about half of the self-referred patients actually need secondary care. Deterring patients from the ED who are actually in need of secondary care may lead to delays in diagnosis and treatment and could lead to higher morbidity and mortality. Furthermore, a visit to a GP followed by an ED-referral, leads to double consultation and thus extra costs.

Practical reasons

Patients visiting the ED out of practical concerns are more often inappropriate. This group can be targeted by interventions aimed at significantly reducing inappropriate self-referrals.

Of the patients reporting practical concerns as reason for self-referral, the accessibility of primary care is frequently reported to be problematic. Although primary care in the Netherlands can be accessed relatively easily and patients can often visit a GP on short notice, patients have to make an appointment to visit a GP and thus cannot always consult a GP at any desired moment. Improving the accessibility of primary care to a level where patients can visit as they please would require large adjustments in the way primary care is organized and may not be feasible or preferable. This means, for reducing self-referral out of practical reasons, only an extra barrier to visit the ED may be effective. A potential barrier would be an additional copayment for ED self-referral. In **chapter 6** we found that a financial barrier would probably be effective in deterring patients from the ED. However, appropriateness was not related to the amount that patients were

willing to pay to visit the ED without a referral. The introduction of an additional co-payment would therefore inevitably lead to deterring patients from the ED who are in need of secondary care. This could create a delay in diagnosis and treatment and lead to dangerous situations. In addition, we found that a higher income increased the copayment patients were willing to pay for visiting the ED directly, which is consistent with previous research.[20,21] A copayment would thus create inequality in access to healthcare. Making the copayment income-based would address this issue, but this would lead to more bureaucracy, additional expenses and difficulties in implementation.

Other interventions to optimize acute care

In order to reduce inappropriate self-referral, address the increasing problem of ED-crowding, improve the quality of acute care and to make it more efficient and cost-effective; the collaboration between the different parties of the acute care chain has to improve the following years.

Emergency Care Access Points

The ideal intervention to address inappropriate self-referral would deter inappropriately self-referred patients from the ED, while creating no barriers in visiting the ED for appropriate self-referred patients. This might be found in the Emergency Care Access Point (ECAP): a GP-cooperative located next to the ED, with a joint triage desk. Self-referred patients present at the triage desk and a medical professional decides through a validated triage instrument whether they need primary care by a GP or secondary care at the ED. This intervention addresses both patients visiting out of health concerns and patients visiting out of practical concerns. Patients are sent to the health care provider best suited for their symptoms and patients no longer need to make this decision themselves. In theory, this system reduces the number of 'double consultations' where a patient is first examined by a GP, and subsequently send to an ED to be examined again. Additionally, it is expected that the number of self-referred patients in the ED will decrease, reducing the total number of patients seen at the ED, thereby reducing crowding.

However, the effect of ECAPs on crowding is controversial. Several studies found that the introduction of ECAPs had the intended effects: after implementation, there was a decrease of ED utilisation and a substantial reduction in the number of self-referred patients in the ED. Several studies reported that after implementation of ECAPs less

urgent patients more often presented to the GP and patients at the ED had a higher probability of serious disease and hospital admission. [22,23,24,25] Although these results are promising, the implementation of ECAPs was not associated with a reduction of length of stay at the ED, which is used as a measure of ED crowding. The introduction of ECAPs changes the case mix in the ED, resulting in a more complex and urgent patient population. So, although the number of patients at EDs is decreased after introducing ECAPs, the level of crowding is not automatically reduced. Moreover, ECAPs do not facilitate the outflow of patients from the ED, which is the most contributing factor to crowding. [5] However, length of stay might not properly reflect the level of crowding, as not all factors that play into crowding are taken into account.

Healthcare costs are becoming increasingly important. Because medical care is more efficient with the introduction of ECAPs, a logical consequence would be a reduction in costs. However, studies have not found the expected reduction in costs with the implementation of ECAPS.[26,27] Yet, these studies are difficult to interpret, because of different registration and funding systems used in GP-cooperatives and EDs. This is a subject to be studied more extensively in the future.

Emergency physicians

In the recent past, Dutch EDs were staffed by young, inexperienced physicians. They received supervision from medical specialists, who were most often not physically present in the ED.[28] In 1994 and in 2004, the Dutch Health Care Inspectorate published reports on the quality of medical care in Dutch EDs and stated that the expertise of the physicians working at the ED and the availability of medical specialists was inadequate.[29,30]

Since then, the ED-population has changed significantly. Patients that present at the ED are becoming increasingly complex, because of ageing of the population, the associated multimorbidity and the ongoing collaboration with GP-cooperatives. [8,31] In addition, more treatments have become available, treatment has become more technical and it is increasingly recognized that early and adequate treatment leads to better outcomes.[8]

As a result of these developments, the ED of today needs a professional team, which can deliver high quality acute healthcare and make sure that necessary treatment is not delayed. Because of their broad medical training, with emphasis on acute care, the emergency physician (EP) is a natural player in the acute care team, who can coordinate practice in the ED and make prompt decisions about acute medical treatment. Several (inter)national studies have indeed shown that EPs deliver high quality medical ED-care,

while reducing unnecessary diagnostics and hospital admissions. [32,33,34] Because of the presence of EPs, more low-threshold diagnostics (e.g. bedside ultrasound) and complex treatments (e.g. procedural sedation and analgesia, non-invasive ventilation) are possible in the ED. For several decades, in the USA, Australia and the UK the EP has been the central specialist in the ED.[35,36,37]In the Netherlands, an increasing number of EDs also have introduced EPs to provide high quality 24/7 emergency care.
Currently, not all Dutch EDs are (fully) staffed with EPs. This can be explained by the fact that there are not enough trained EPs yet. Some hospitals have chosen a different approach, dependent on the specific patient population the hospital serves and (super) specialized medical care it provides. For some hospitals this may better suit their patient population and logistic situation. In the tertiary care centres, medical specialists like trauma surgeons, intensivists and interventional cardiologists already have to be present 24/7. Here, the added value of an EP can be to coordinate and oversee the care for acutely ill patients.

Improving communication between different parties in the acute care chain
To further improve the appropriateness of patients in the ED, it might be beneficial if EPs can help GPs and ambulance personal to decide whether a patient should be send to the ED. In addition, real-time advice from an EP might help GPs and ambulance personal in providing acute medical care. Through an internet connection, an EP can 'examine' a patient without being at the same location and give advice on diagnostics and treatment. In the USA, currently pilot studies are unrolled to have EPs examine and treat patients (mainly in remote settings) while being present at another hospital. [38] This so called telecommunication might improve early treatment and prevent referral of patients who are not in need of acute secondary care.
As we have shown in **chapter 8**, the admission probability of ED-patients can be easily determined based on the following factors; age, triage category, arrival mode and symptoms. When this probability is clearly communicated at an early stage, a hospital admission can be anticipated by the EP and supporting staff. In times of hospital bed shortages it can make hospital planners more aware of impending admissions, so this can be taken into account in their decisions.
In addition, 24/7 real-time insight into the hospital and care home bed capacity for the different parties in the care chain can make care more efficient. The 'Acuut Zorgportaal' can be used to share this information through an internet connection. This way the

Ambulance Dispatch Center can transport patients directly to hospitals with sufficient bed capacity and it will help ED-physicians to arrange transfers quicker and smoother for selected patients to care homes.
Further, 24/7 on-call nursing care at home would make it possible for a specific group of patients, who would otherwise be hospitalized, to return home from the ED. However, it needs to be assessed whether introducing this type of care would be feasible and cost-effective.

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CHAPTER 10

Summary

Samenvatting

SUMMARY

This thesis focused on self-referred patients in Dutch Emergency Departments (EDs) and studied interventions to reduce inappropriate self-referral and length of stay in EDs.

In **chapter 2** a systematic review was performed to explore the motives of self-referred patients to visit the ED worldwide. Thirty relevant publications were identified in the literature, of which sixteen studies only included patients with non-urgent problems. The number of included patients differed considerably between the selected studies and also patient characteristics and study methodologies were heterogeneous. Various motives for self-referral were found, with overlapping motives between studies. The reasons for self-referral were categorized into seven main themes: health concerns, expected investigations; convenience of the ED; lesser accessibility of primary care; no confidence in general practitioner/primary care; advice from others and financial considerations. Performing a random-effects meta-analysis, we found that the most reported themes for self-referral were 'health concerns' and 'expected investigations': by respectively 36% (95% CI 23–50%) and 35% (95% CI 20-51%). Financial considerations most often played a role in the United States with a reported percentage of 33% versus 4% in other countries ($p < 0.001$). The results of this study show that health concerns are a major motivation for patients to self-refer to the ED, also for patients with non-urgent symptoms. This might be an important explanation for the limited effects of previous interventions that aimed to reduce self-referral; people, who are worried about their health, will not be easily discouraged from seeking help at the ED.

In **chapter 3** the reasons for ED self-referral were explored performing a questionnaire study, and subsequently correlated to the appropriateness of the ED-visits. Questionnaires, that included questions on reasons to visit the ED directly, were handed to self-referred patients visiting the ED of the Rijnstate Hospital. Patients were included over four separate months (April, July and October of 2012 and January of 2013) to avoid bias based on seasonal variation. From the 3196 self-referred patients that visited the ED during the inclusion period, 48.9% completed the questionnaires. The majority of patients (28.0%) attended the ED without a referral because they thought they would get help faster. Other frequently selected reasons were: the easier access to radiologic and laboratory investigations (answered by 23.8%); and symptoms that were considered too severe

to visit a general practitioner (GP) (answered by 22.7%). Predefined criteria were used to determine the appropriateness of an ED-visit. We found that females, elderly, and patients in higher triage categories significantly more often visited the ED appropriately. Subsequently, the reasons for self-referral were correlated to the appropriateness of the visits. Patients who expect investigations are necessary, think their symptoms are too severe to visit a GP, or would return to the ED next time with similar symptoms more often visit the ED appropriately. This study shows that patients are looking for specialist help for their perceived urgent symptoms and want fast and easy access to radiologic and laboratory investigations. While the Netherlands has a well-developed primary care network, the reasons for self-referral in the Netherlands are similar to reasons found in previous literature from other countries. Patients visiting the ED out of health concerns are more often visiting appropriately compared to patients visiting for practical reasons.

In **chapter 4** a qualitative interview study was performed, to explore the reasons for ED self-referral in greater depth. A predefined topic guide was developed to guide the interviews, which was modified during the inclusion period, practicing cyclic analysis. We recruited a purposive sample of self-referred patients in the ED and aimed to include patients from different age groups, gender, and ethnicities, attending at different times and shifts. In addition, also patients in need of urgent care were asked to participate, after being treated first. Between November 2014 and February 2015, thirty self-referred patients at the ED of the Rijnstate Hospital were interviewed. Most of the participants were male (63%), with a mean age of 46 years. Self-referred patients were included until no new reasons for attending the ED were found and saturation was reached. The information from the interviews was coded independently by two investigators and combined into meaningful clusters. Subsequently, these were categorized into themes to build a framework of reasons for self-referral to the ED. Characteristic quotes were used to illustrate the acquired theoretical framework. Two clearly distinctive themes emerged from the interviews that are pertinent to the patients' decisions to attend the ED: (1) health concerns and (2) practical issues. The division of these two main themes seems to apply to other studies on reasons for ED self-referral, but this was never stated this clearly before.

Self-referred visits account for almost 20% of all ED-visits in the Netherlands, varying from lower percentages in less dense populated regions and higher in inner-city EDs.

Some of these self-referred ED-visits are considered inappropriate, because patients receive care that a GP can provide. In **chapter 5** we aimed to find a reliable percentage of appropriate ED-visits by self-referred patients in the Netherlands. An observational, prospective study was performed in the ED of the Rijnstate Hospital. 3196 self-referred patients were included over four separate months (April, July and October of 2012 and January of 2013). The majority was male (58.7%) and most self-referred patients were under the age of 40, were classified in triage category 'green' and visited with injuries (e.g. lacerations, distortions and fractures). The appropriateness of an ED visit was determined at two time points. First, after the primary assessment of the patient, using predefined criteria. According to the predefined criteria, 1862 (58.8%) visits were classified as appropriate. Second, appropriateness was determined at the moment the patient left the ED, based on the diagnosis and treatment received. Two emergency physicians (EPs) independently classified diagnoses and treatments as primary or secondary care. When the second time point was taken into consideration, 48.1% of the patients had a secondary care diagnosis and/or needed secondary care treatment, classifying their visits as appropriate. Finally, the perspective of the self-referred patients was taken into account using a questionnaire; 76.7% classified their visit as appropriate, stating they would visit the ED without a referral again confronted with similar symptoms. In conclusion, the percentage of appropriate ED-visits by self-referred patients measured by different methods ranged from 48.1 to 58.8%. We believe these percentages are more reliable than those found in previous (Dutch) studies because in contrast to these studies, multiple predefined, unambiguous criteria and a combination of diagnosis and treatments were used.

Recently, the introduction of a copayment for ED self-referral was considered by the Dutch Minister of Health to reduce healthcare costs. In **chapter 6** a questionnaire study was performed to study what the effects of this measure would be and at what amount patients would turn to a GP before visiting an ED. As secondary outcomes, we studied the costs of an ED-visit and the knowledge of the self-referred patients regarding those costs and their insurance. Between March and July 2015, 433 patients were included. With a copayment of €100 per visit, 47% of the self-referred patients would choose to visit their GP instead of the ED. A further increase of the copayment amount turned out to be largely ineffective in reducing the number of self-referred ED visits. There is no significant relation between appropriateness and the amount of copayment that patients

are willing to pay and we found no specific copayment level that resulted in reducing mainly inappropriate ED visits. The higher the household income and education level and the more urgent the triage category, the larger the copayment patients are willing to pay. The average tariff of an ED visit was €298. The price of an ED-visit ranged from €206 (the basic rate) to €4975. Thirty-nine percent of the self-referred patients believed that the charges of their ED visit were lower than they actually were, 42% chose the right price, and 19% believed that the charges of their ED visit were higher than they actually were. Most patients (63%) had supplementary insurance, while 13% did not know how they were insured. Thirty percent did not know their deductible excess amount and only 7% increased this amount (with a reduction in their insurance premium in return). Almost half of the patients believed that they would have to pay for their visit to the GP or GP-cooperative, which is not the case. Further, over 30% believed that visiting the ED would be free of charge, which is only true for patients who have already reached their deductible excess that year. We found no specific copayment level that resulted in reducing mainly inappropriate ED visits, indicating that the introduction of a copayment would inevitably deter patients in need of secondary care from the ED. In addition, we found that the financial regulations and charges in Dutch healthcare are often not clear for patients.

The Netherlands has a well-developed primary care system, which increasingly collaborates with EDs. A growing number of EDs and GP-cooperatives form Emergency Care Access Points (ECAPs), sharing one triage desk, from where patients are triaged to be seen at the ED or at the GP-cooperative. In **chapter 7** the correlation between patients' length of stay in the ED and their care pathways (origin and destination) are compared in an observational, multicenter study. Seven Dutch EDs from across the Netherlands were included, which was considered a representative sample. Included were 3 EDs with an ECAP and 4 EDs without an ECAP. From 1 February 2013, 7000 ED patient records were analyzed. The median length of stay of ED-patients was 130.0 min, which increased with patients' age. Random coefficient regression analysis showed that the length of stay for patients referred by medical professionals was 32.9 min longer compared to self-referred patients. Length of stay for patients admitted to hospital was 41.2 min longer compared to patients followed-up at an outpatient clinic, 49.9 min longer compared to patients followed-up at a GP and 44.6 min longer compared to patients who did not receive follow-up. In ECAP EDs, 15.6% of patients were self-referred, compared to 38.7% in

non-ECAP EDs. There was no difference in length of stay between hospitals with or without an ECAP. Length of stay in Dutch EDs is relatively short compared to other countries. Despite reducing the number of self-referred patients at ECAP-EDs, the mean length of stay is not reduced. This is probably because, after deterring the inappropriate self-referrals with a shorter length of stay, the resulting case mix in ECAP-EDs is more complex and therefore the mean length of stay is increased.

As shown in chapter 7, the length of stay at the ED is around 45 minutes longer for patients who are admitted to the hospital compared to patients who are not admitted. An important contributing factor to crowding at EDs is the delay before actual hospital admission. Knowing the probability of hospital admission for the individual ED-patient might help to anticipate admission and thereby reduce the length of stay at the ED. In **chapter 8** factors that influence the admission probability of ED patients were identified and a simple prediction tool, to calculate the probability of hospital admission directly after triage for a mixed ED-population, was created. In the development dataset 1261 patients were included. Performing a multivariate logistic regression analysis four contributing factors for hospital admission were identified: age, triage category, arrival mode and main symptom. Using these factors, an admission prediction model was developed. A prospective validation of this prediction model was performed locally and at two regional hospitals (one community hospital and one academic hospital). This showed that this model reliably predicts whether an ED-patient will be admitted to two community hospitals (AUC 0.87) and to an academic hospital (AUC 0.77). The developed model was converted into a simple prediction tool. With this prediction tool the probability of hospital admission for a mixed ED-population can be calculated with data directly available after triage. Further research is needed to show whether the use of such an admission prediction tool can reduce length of stay at the ED and therefore reduce crowding.

SAMENVATTING

In dit proefschrift worden studies beschreven die de omvang van het probleem van zelfverwijzende patiënten op Nederlandse Spoedeisende Hulpen (SEH's) nader in kaart brengen en studies waarin interventies onderzocht worden die in potentie onterechte zelfverwijzing en de ligduur op SEH's kunnen verminderen.

In **hoofdstuk 2** is een systematische review uitgevoerd om te onderzoeken wat wereldwijd de redenen voor zelfverwijzing naar SEH's zijn. Er werden 30 relevante artikelen gevonden, waarvan zestien studies alleen patiënten includeerden met niet-urgente problematiek. Het aantal geïncludeerde patiënten varieerde sterk tussen de studies en ook de patiënt-karakteristieken en gebruikte onderzoeksmethoden waren heterogeen. Verscheidende, vaak overlappende, motieven voor zelfverwijzing werden gevonden. De redenen voor zelfverwijzing werden gecategoriseerd in zeven hoofdthema's: zorgen om gezondheid, verwachting aanvullend onderzoek nodig te hebben, gemak van de SEH, slechtere toegankelijkheid van eerstelijns zorg, geen vertrouwen in huisarts / eerstelijns zorg, advies van anderen en financiële overwegingen. Door middel van een 'random-effects meta-analyse' vonden we de meest gerapporteerde redenen voor zelfverwijzing: 'zorgen om gezondheid' en 'verwachting aanvullend onderzoek nodig te hebben', met respectievelijk 36% (95% BI 23–50%) en 35% (95% BI 20-51%). Financiële overwegingen speelden het meest frequent een rol in de Verenigde Staten, met een percentage van 33%, en slechts 4% in overige landen ($p<0.001$). Deze resultaten geven aan dat patiënten vooral een SEH bezoeken zonder verwijzing vanwege zorgen omtrent hun gezondheid, ook als er sprake is van niet-urgente problematiek. Dit verklaart mogelijk de beperkte effecten van eerdere interventies gericht op het verminderen van zelfverwijzing: mensen, oprecht bezorgd om hun gezondheid, zullen niet snel ontmoedigd zijn in het zoeken van hulp bij een SEH.

In **hoofdstuk 3** zijn de redenen voor zelfverwijzing onderzocht middels vragenlijsten en zijn deze redenen vervolgens gerelateerd aan de terechtheid van de SEH-bezoeken. Vragenlijsten werden uitgedeeld aan patiënten die zonder verwijzing de SEH van het Rijnstate ziekenhuis bezochten. Patiënten werden geïncludeerd gedurende 4 losstaande maanden (april, juli, oktober 2012 en januari 2013) om bias op basis van seizoensvariatie te voorkomen. Van de 3196 zelfverwijzers die de SEH bezochten tijdens de inclusieperiode, heeft 48,9% de vragenlijsten ingevuld. De meerderheid (28,0%) bezocht de SEH

zonder verwijzing, omdat zij dachten hier sneller geholpen te worden. De volgende meest gekozen redenen waren: gemakkelijkere toegang tot aanvullend onderzoek (23,8%) en symptomen die te ernstig waren om een huisarts te bezoeken (22,7%). Middels vooraf opgestelde criteria werd bepaald of een SEH-bezoek geïndiceerd was. Vrouwen, ouderen en patiënten in hogere triagecategorieën bleken significant vaker terecht de SEH te bezoeken. Patiënten die dachten dat aanvullend onderzoek nodig was, hun symptomen te ernstig vonden voor een bezoek aan de huisarts, of met dezelfde klachten opnieuw direct de SEH zouden bezoeken, bezochten eveneens vaker terecht de SEH. Deze studie laat zien dat zelfverwezen patiënten op zoek zijn naar specialistische hulp voor hun ervaren urgente symptomen en dat zij snelle en gemakkelijke toegang willen tot aanvullend onderzoek. Hoewel Nederland een goed ontwikkelde eerstelijns gezondheidszorg heeft, komen de redenen voor zelfverwijzing uit deze studie overeen met redenen die gevonden zijn in eerdere, buitenlandse studies. Patiënten die de SEH bezoeken vanuit zorgen om hun gezondheid zijn vaker terecht op een SEH, vergeleken met patiënten die de SEH bezoeken vanuit praktische overwegingen.

In **hoofdstuk 4** werd een kwalitatieve interviewstudie uitgevoerd naar de redenen voor zelfverwijzing. De interviews werden afgenomen aan de hand van een vooraf ontwikkelde 'topic guide'. Hierbij werd cyclische analyse toegepast, waarbij de topic guide gedurende de onderzoeksperiode werd aangepast. Een gerichte steekproef van patiënten, die zonder verwijzing de SEH van het Rijnstate Ziekenhuis bezochten, werd samengesteld. Patiënten van verschillende leeftijden, geslacht en etniciteit werden geïncludeerd. Ook patiënten die acute zorg nodig hadden werden geïncludeerd, maar pas nadat hun behandeling was gestart. Zelfverwijzers werden geïncludeerd tot er geen nieuwe redenen voor zelfverwijzing naar boven kwamen en daarmee saturatie bereikt was. Tussen november 2014 en februari 2015 werden er dertig zelfverwijzers geïnterviewd; de meeste deelnemers waren man (63%), met een gemiddelde leeftijd van 46 jaar. De informatie uit de interviews werd door twee onderzoekers onafhankelijk van elkaar gecodeerd en gecombineerd in betekenisvolle clusters. Vervolgens werden deze gecategoriseerd in thema's om een raamwerk van redenen voor zelfverwijzing te creëren. Karakteriserende quotes werden gebruikt om het theoretische raamwerk te illustreren. Twee duidelijk verschillende thema's kwamen naar boven uit de interviews: (1) zorgen om gezondheid en (2) praktische overwegingen. Deze tweedeling lijkt tevens toepasbaar te zijn op eerdere studies naar redenen voor zelfverwijzing, maar was niet eerder zo duidelijk gesteld.

Bijna 20% van de SEH-bezoeken in Nederland is zelfverwezen, variërend van lagere percentages in minder dichtbevolkte gebieden naar hogere op binnenstedelijke SEH's. Een deel van deze zelfverwezen SEH-bezoeken wordt als onterecht beschouwd, omdat patiënten zorg krijgen die een huisarts ook had kunnen bieden. In **hoofdstuk 5** werd gezocht naar een betrouwbaar percentage terechte zelfverwezen SEH-bezoeken in Nederland. Een observationele, prospectieve studie werd uitgevoerd op de SEH van het Rijnstate Ziekenhuis. 3196 zelfverwezen patiënten werden geïncludeerd gedurende vier losstaande maanden (april, juli, oktober 2012 en januari 2013). De meerderheid was man (58,7%) en de meeste zelfverwijzers waren jonger dan 40 jaar, geclassificeerd in triage categorie 'groen' en bezochten de SEH vanwege traumatische letsels (zoals wonden, verstuikingen en fracturen). De terechtheid van een SEH-bezoek werd bepaald op twee momenten. Ten eerste, na de primaire beoordeling van een patiënt, op basis van vooraf opgestelde criteria. Op basis van deze criteria, werden 1862 bezoeken (58,8%) geclassificeerd als terecht. Ten tweede, op het moment dat de patiënt de SEH had verlaten, op basis van de gestelde diagnose en gegeven behandeling. Hierbij werd gevonden dat er bij 48,1% van de bezoeken een tweedelijns diagnose was gesteld en/of een tweedelijns behandeling was uitgevoerd, waarmee deze bezoeken als terecht werden geclassificeerd. Vervolgens werd ook het perspectief van de zelfverwezen patiënten meegenomen, middels een vragenlijst: 76,7% van de zelfverwijzers vond hun bezoek terecht, waarbij zij aangaven een volgende keer opnieuw direct een SEH te bezoeken, bij het ervaren dezelfde symptomen. Concluderend ligt het percentage van terechte SEH-bezoeken door zelfverwijzers, bepaald middels verschillende methoden, tussen 48,1 en 58,8%. We denken dat deze percentages betrouwbaarder zijn, dan de percentages gevonden in eerdere studies, omdat wij in tegenstelling tot eerdere studies, meerdere vooraf opgestelde criteria en een combinatie van diagnose en behandeling hebben gebruikt.

Recent werd door de Nederlandse Minister van Volkgezondheid, Welzijn en Sport de introductie van een eigen bijdrage bij zelfverwijzing naar een SEH overwogen, om de kosten in de gezondheidszorg te verlagen. In **hoofdstuk 6** is een vragenlijststudie uitgevoerd om te onderzoeken wat de effecten van een dergelijke maatregel zouden zijn en bij welke hoogte van de eigen bijdrage patiënten naar een huisarts zouden gaan, in plaats van direct een SEH te bezoeken. Als secundaire uitkomsten, hebben we onderzocht wat de kosten van een SEH-bezoek zijn en hoe de kennis van zelfverwezen patiënten is ten aanzien van deze kosten en hun verzekering. Tussen maart en juli

2015, werden er 433 patiënten geïncludeerd. Bij een eigen bijdrage van €100, bovenop het eigen risico, zou 47% van de zelfverwijzers naar de huisarts gaan, in plaats van naar een SEH. Een verdere ophoging van dit bedrag bleek nauwelijks effectief in het verder verlagen van het aantal zelfverwijzers. Er bleek geen significante relatie tussen de terechtheid van een SEH-bezoek en de hoogte van de eigen bijdrage, waarbij patiënten niet langer direct de SEH zouden bezoeken en we vonden geen specifiek bedrag waarbij voornamelijk onterechte SEH-bezoeken werden geweerd. Hoe hoger het inkomen en het opleidingsniveau en hoe urgenter de triagecategorie, hoe hoger het bedrag dat patiënten bereid waren te betalen voor een direct bezoek aan de SEH. Het gemiddelde tarief van een SEH-bezoek was €298. Het tarief van een SEH-bezoek varieerde van €206 (het basistarief) tot €4975. Van de zelfverwezen patiënten dacht 39% dat de prijs van hun SEH-bezoek lager lag dan het daadwerkelijke tarief, 42% koos de juiste prijscategorie en 19% dacht dat de prijs hoger lag dan deze daadwerkelijk was. De meerderheid (63%) had een aanvullende verzekering, terwijl 13% niet wist hoe zij verzekerd was. Dertig procent wist de hoogte van het eigen risico niet en slechts 7% had het eigen risico verhoogd (met een verlaging van hun verzekeringspremie). Bijna de helft van de patiënten dacht dat zij moesten betalen voor een bezoek aan de huisarts of huisartsenpost, wat niet het geval is. Daarnaast dacht 30% dat de SEH hen niets kostte, wat alleen klopt wanneer het eigen risico van het betreffende jaar bereikt is. We vonden geen specifiek bedrag aan eigen bijdrage, waarbij voornamelijk onterechte bezoeken van de SEH worden geweerd. Dit betekent dat bij de introductie van een eigen bijdrage onvermijdelijk ook patiënten die, mogelijk dringend, tweedelijnszorg nodig hebben van de SEH worden geweerd. Daarnaast vonden we dat de financiële regelingen en kosten in de Nederlandse gezondheidszorg vaak onduidelijk zijn voor patiënten.

Nederland heeft een sterk ontwikkelde eerstelijns gezondheidszorg, die steeds vaker samenwerkt met SEH's. Een toenemend aantal SEH's en huisartsenposten vormen samen ECAP's (Emergency Care Access Points). Hier bestaat een gezamenlijk triagepunt, van waaruit patiënten worden getrieerd om gezien te worden op de SEH of op de huisartsenpost. In **hoofdstuk 7** wordt de relatie tussen de ligduur op de SEH en hun zorgpad (oorsprong en bestemming) vergeleken in een observationele, multicenter studie. Hiervoor werden zeven Nederlandse SEH's, verspreid over het land, geïncludeerd. Drie van deze SEH's hadden een ECAP en vier van deze SEH's hadden geen ECAP. Vanaf 1 februari 2013 werden 7000 SEH-patiëntendossiers geanalyseerd. De mediane ligduur

was 130,0 minuten, welke opliep met de leeftijd. De ligduur voor verwezen patiënten was 32,9 minuten langer dan voor zelfverwezen patiënten. De ligduur voor patiënten die opgenomen werden in het ziekenhuis, was 41,2 minuten langer dan voor patiënten die vervolgd werden op de polikliniek, 49,9 minuten langer dan voor patiënten die werden vervolgd bij een huisarts en 44,6 minuten langer dan voor patiënten die geen follow-up nodig hadden. Op de SEH's met ECAP was 15,6% van de patiënten zelfverwezen, tegenover 38,7% op de SEH's zonder ECAP. Er was geen verschil in ligduur tussen SEH's met of zonder ECAP. De ligduur op Nederlandse SEH's is relatief kort vergeleken met andere landen. Ondanks dat het aantal zelfverwijzers lager is op ECAP-SEH's, is de gemiddelde ligduur niet afgenomen. Dit komt waarschijnlijk doordat, nadat onterechte zelfverwijzers met een kortere ligduur zijn geweerd van de SEH, de resulterende casemix op de SEH complexer is en dus een langere ligduur heeft.

Zoals werd gevonden in hoofdstuk 7, is de ligduur op de SEH ongeveer 45 minuten langer voor patiënten die worden opgenomen in het ziekenhuis, in vergelijking tot patiënten die niet worden opgenomen. Een belangrijke bijdragende factor tot overmatige drukte op SEH's is het oponthoud voor een daadwerkelijke opname. Het zou kunnen helpen om de opnamekans voor de individuele SEH-patiënt vroegtijdig te weten, zodat er geanticipeerd kan worden op een opname en de ligduur op de SEH mogelijk verminderd kan worden. In hoofdstuk 8 zijn factoren die de opnamekans beïnvloeden geïdentificeerd en werd er een gemakkelijk te gebruiken opnamekansmodel gecreëerd. In de ontwikkelingsdataset werden 1261 patiënten geïncludeerd. Hierop werd een multivariate logistische regressie analyse uitgevoerd, waarbij vier bijdragende factoren voor een ziekenhuisopname werden gevonden: leeftijd, triagecategorie, aankomstroute en hoofdklacht. Middels deze factoren werd een opnamekansmodel ontwikkeld. Dit voorspellingsmodel werd prospectief gevalideerd; lokaal en in twee regionale ziekenhuizen (een perifeer ziekenhuis en een academisch ziekenhuis). Hieruit bleek dat dit model betrouwbaar voorspelt of een SEH-patiënt wordt opgenomen in de twee perifere ziekenhuizen (AUC 0,87) en in een academisch ziekenhuis (AUC 0,77). Het ontwikkelde opnamekansmodel werd geconverteerd naar een gemakkelijk te gebruiken voorspel-instrument. Middels het ontwikkelde voorspel-instrument kan de kans op opname voor een gemengde SEH-populatie gemakkelijk worden uitgerekend, direct na triage. Verder onderzoek is nodig om te zien of het gebruik van een dergelijk instrument de ligduur op de SEH kan verminderen en hiermee overmatige drukte kan reduceren.

APPENDICES

Dankwoord

Curriculum Vitae

DANKWOORD

Geachte Prof. Dr. Edwards, beste Michael, als mijn promotor wist je altijd weer een nieuwe invalshoek te vinden. Na even samen sparren, kon ik weer verder.
Geachte Prof. Dr. Kaasjager, beste Karin, hoewel je pas in een latere fase betrokken werd bij het onderzoek, heb ik veel gehad aan je visie op de spoedeisende zorg in Nederland.
Geachte Dr. van Leeuwen, beste Henk, bedankt voor je fijne bijdrage, vooral die review was een hele worsteling.
Geachte Dr. Thijssen, beste Wendy, dankzij jouw ervaring in het doen van onderzoek op de spoedeisende hulp kon je een zinnige bijdrage leveren.

Douwe, bedankt voor al je inzet in de afgelopen jaren. Jij was er vanaf het prille begin bij, toen ik als ANIOS had bedacht onderzoek te willen gaan doen op de Spoedeisende Hulp. Vooral de eerste periode hebben we veel samen nagedacht over de opzet en de uitvoering. Hoewel ik intussen meer op eigen benen sta, is het nog altijd prettig om onderzoekszaken met je te bespreken. Ontzettend bedankt hiervoor!

Beste Lian, vele keren hebben we samen naar de bergen data gekeken en nagedacht over de juiste verwerking en interpretatie. Nog veel vaker heb ik je weten te vinden per mail. Uiteindelijk heb je aan bijna ieder artikel wel een bijdrage geleverd, bedankt.

Beste medeauteurs, Lisa Willink, Peter Lucassen, Lillian van den Brand en Laura Horstink; bedankt voor de prettige samenwerking.

Beste Karel, jij was degene die me introduceerde bij Michael Edwards, waardoor mijn onderzoek werd voortgezet in een promotietraject. Bedankt!

Leden van de vakgroep Spoedeisende Geneeskunde in het Rijnstate, bedankt voor alle ruimte en steun die jullie mij hebben geboden in het doen van mijn onderzoek. Ik vind dat we een erg fijne club hebben. Ik ben er trots op om met jullie op deze mooie Spoedeisende Hulp te mogen werken.

SEH-verpleegkundigen, bedankt voor alle hulp. Het 'vuile werk', zoals uitdelen en aannemen van stapels vragenlijsten en includeren van patiënten, kwam vaak op jullie schouders terecht. Ontzettend bedankt voor jullie medewerking!

Lieve Frans, bedankt voor de mooie tijd.

Lieve Ines, van een fijne collega naar een echte vriendin.

Lieve vriendinnen van het Zwijsen, we kennen elkaar intussen alweer even en zijn samen opgegroeid vanaf de brugklas. Al vele memorabele momenten achter de rug en hopelijk nog vele te gaan. Al zien we elkaar niet heel vaak, we weten altijd probleemloos de draad weer op te pakken.

Lieve Melaena's, ik had jullie graag anders aangesproken, maar dit is nu eenmaal de naam die is blijven hangen. Het is leuk om te zien hoe ieder haar richting vindt na de geneeskunde studie. Heerlijk om met jullie bij te kletsen en te borrelen, maar ook in moeilijker tijden weten we elkaar te vinden.

Lieve Jesse, nog pril, maar ik zie een toekomst samen met jou.

Lieve pap en mam, onvoorwaardelijk hebben jullie altijd in mij geloofd en me gesteund. Niets is jullie te veel en altijd kan ik op jullie rekenen. Ontzettend bedankt voor de liefdevolle en stabiele basis die ik heb gekregen. Het is fijn thuiskomen bij jullie.

Lieve Judith, ik heb veel bewondering voor jouw kracht en doorzettingsvermogen. Op naar een geweldige toekomst.

CURRICULUM VITAE

Nicole Kraaijvanger was born on the 24th of April 1986, in Sint-Oedenrode. In 2004 Nicole graduated from the atheneum at the Zwijsen College in Veghel and started studying medicine at the Radboud University in Nijmegen. In 2010 she did her final internship at the Emergency Department (ED) of the Radboudumc, under the supervision of Nathalie Ververs, MD and Prof. Dr. Edwards. After finishing medical school in 2010, she worked at the ED of Gelre Ziekenhuizen in Zutphen. In 2011 she started working at the ED of the Rijnstate Hospital. First, as a non-trainee and later as a trainee, under the supervision of Sieuwert-Jan ten Napel, MD.

During her residency, Nicole started doing research concerning self-referred patients at the ED, together with Douwe Rijpsma, MD, and under supervision of Prof. Dr. Edwards, Prof. Dr. Kaasjager, Dr. van Leeuwen and Dr. Thijssen.

In 2015, she finished her training and since then she has worked as an emergency physician at the Rijnstate Hospital. Besides her work and PhD-project, Nicole is an instructor at the Advanced Trauma Life Support course, the Toxicology for Emergency Medicine course and she educates general practitioners in training at Schola Medica.